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3/30 22426 MWB

March 27, 2015

Mr. N.J. Deiuliis
Manager
Fola Coal Company, LLC
c/o Consol Energy, Inc.
1000 Consol Energy Drive
Canonsburg, PA 15317

2015 MAR 30 PM 1:44

By Certified Mail – Return Receipt Requested

Re: Supplemental 60-Day Notice of Intent to File Citizen Suit Under Clean Water Act Section 505(a)(1) and (f)(5) for Violations of the Terms and Conditions of West Virginia 401 Certifications at Fola Surface Mines #2, #4A and #6

Dear Mr. Deiuliis:

The Sierra Club, Ohio Valley Environmental Coalition, the West Virginia Highlands Conservancy, and the West Virginia Rivers Coalition (collectively "WV Environmental Groups"), in accordance with section 505(b)(1) of the Clean Water Act (the "Act" or the "CWA") 33 U.S.C. § 1365(b)(1) and 40 C.F.R. Part 135, hereby notify you that Fola Coal Company, LLC ("Fola") has violated and continues to violate "an effluent standard or limitation" under Section 505(a)(1)(A) of the Act, 33 U.S.C. § 1365(a)(1)(A) and (f)(5), by failing to comply with the terms and conditions of CWA § 401 certifications, issued by the West Virginia Department of Environmental Protection (WVDEP), in conjunction with Fola's § 404 permits, issued by the U.S. Army Corps of Engineers (the Corps), for Fola's Surface Mines #2, #4A and #6 in the Leatherwood Creek watershed in West Virginia. If within sixty days of the postmark of this letter Fola does not bring itself into full compliance with the Act, we intend to either file a new citizen's suit, or to amend and supplement the claims in the pending citizen suit in *OVEC v. Fola Coal Co.,* Civil No. 2:13-21588 (S.D.N.Y.). The WV Environmental Groups will seek civil penalties and declaratory and injunctive relief for Fola's ongoing and continuing violations and an injunction compelling Fola to come into compliance with the Act.

This notice serves as a supplement to prior notices sent by the WV Environmental Groups to Fola on February 8, 2013, April 3, 2013, and May 23, 2013 for Fola's violations of its NPDES permits under the CWA and its mining permits under the Surface Mining Control and Reclamation Act (SMCRA) at Surface Mines #2, #4A, and #6.

For our factual statement and description of the violations, the WV Environmental Groups incorporate by reference the attached expert report of Dr. Margaret Palmer and the Stipulation in *OVEC v. Fola Coal Co.,* Civil No. 2:13-21588, Doc. #53. These documents describe (1) Fola's mining activities at, and discharges from, each of the three mines, (2) the chemical and biological conditions in downstream waters, and (3) the scientific evidence showing that Fola's discharges and mining activities are causing or materially contributing to chemical and biological impairment of the downstream waters, in violation of West Virginia water quality standards set forth at 47 C.S.R. §§ 2-3.2.e & 2-3.2.i. Those standards are violated if wastes discharged from a mining operation "cause" or "materially contribute" materials "that are harmful . . . or toxic to . . . aquatic life" or that have "significant adverse impacts to the chemical . . . or biological components of aquatic ecosystems."

Fola's stream-impacting activities at each of the three mines were authorized by a Nationwide Permit (NWP) issued by the U.S. Army Corps of Engineers under § 404(e) of the CWA. 33 U.S.C. § 1344(e). The Corps issued an authorization under the 1991 NWP for Surface Mine #2 on February 2, 1994, an authorization under the 2002 NWP 21 for Surface Mine #4A on October 24, 2003, and an authorization under the 1996 NWP for Surface Mine #6 on June 5, 2000.

Before the Corps may issue a § 404 permit, it must obtain a certification from the state that the project will not violate that state's water quality standards. 33 U.S.C. § 1341 (CWA § 401). WVDEP's § 401 certifications to the Corps for the 1991, 1996 and 2002 NWPs contained certain standard conditions that must be met at mines with NWP authorizations. These standard conditions serve as federally enforceable effluent limits on Fola's discharge from its mines into waters of the United States. 33 U.S.C. § 1365(f)(5).

Fola has violated and is violating three of those standard conditions at each of the three mines. The dates and locations of the violating discharges and mining activities are set forth in the attached expert report and stipulation. The three conditions were essentially the same in WVDEP's three certifications for the 1991, 1996 and 2002 NWPs. We quote below from the certification for the 2002 NWPs. *See* U.S. Army Corps of Engineers, Nationwide Permits for the State of West Virginia, Standard Conditions for Nationwide Permits (April 8, 2002) (relevant pages attached).

One condition is that "[t]he permittee will comply with water quality standards as contained in the West Virginia Code of State Regulations, Requirements Governing Water Quality Standards, Title 46, Series." *Id.* at 61, Condition 13. At each mine, Fola's discharges and mining activities are causing or materially contributing to chemical and biological impairment of the downstream waters, in violation of West Virginia water quality standards set forth at 47 C.S.R. §§ 2-3.2.e & 2-3.2.i.

A second condition is that "[s]poil materials from the watercourse or onshore operations, including sludge deposits, will not be dumped into the watercourse or deposited in wetlands or other areas where deposit may adversely affect surface or ground waters of the state." *Id.* at 59, Condition 3. At each mine, the spoil materials from Fola's mining operations have adversely affected the surface waters of the state, i.e., the tributaries and main stem of Leatherwood Creek downstream from its mines, by causing or materially contributing to chemical and biological impairment of those waters, in violation of West Virginia water quality standards set forth at 47 C.S.R. §§ 2-3.2.e & 2-3.2.i.

A third condition is that "[f]ill is to be clean, nonhazardous, and of such composition that it will not adversely affect the biological, chemical or physical property of the receiving waters." *Id.* at 59, Condition 5. At each mine, the fill used by Fola has adversely affected the biological, chemical and physical properties of the receiving waters, as evidenced by the fact that tributaries and main stem of Leatherwood Creek downstream from its mines are biologically impaired and violate West Virginia water quality standards set forth at 47 C.S.R. §§ 2-3.2.e & 2-3.2.i.

The Clean Water Act authorizes citizens to sue "any person . . . who alleged to be in violation of . . . an effluent standard or limitation under this chapter." 33 U.S.C. § 1365(a)(1). An "effluent standard or limitation under this chapter" is defined to include "a certification under section 1341 of this title." *Id.*, § 1365(f)(5). A person who violates a condition in a § 401 certification is therefore in violation of the CWA and subject to a citizen enforcement action under the CWA. *Stillwater of Crown Point Homeowners Ass'n Inc. v. Stiglich*, 999 F. Supp. 2d 1111, 1124-25 (N.D. Ind. 2014); *N.C. Shellfish Growers Ass'n v. Holly Ridge Associates, LLC.*, 200 F. Supp.2d 551, 558 (E.D. N.C. 2001). Based on the available evidence, and the absence of any corrective measures taken by Fola since its mining operations began, we believe Fola's violations are ongoing. If Fola does not cease those violations within 60 days, we intend to bring a citizen suit against Fola under Section 505(a)(1) of the Clean Water Act seeking civil penalties and injunctive relief. Be aware that this notice is sufficient to allow us to sue Fola for any post-notice violations related to the violations described herein. See generally, Public Interest Research Group of N.J., Inc. v. Hercules, Inc., 50 F.3d 1239 (3rd Cir. 1995).

If Fola has taken any steps to eradicate the underlying cause of the violations described above, or if Fola believes that anything in this letter is inaccurate, please let us know. If Fola does not advise us of any remedial steps during the 60-day period, we will assume that no such steps have been taken and that violations are likely to continue. Additionally, we would be happy to meet with Fola or its representatives to attempt to resolve these issues within the 60-day notice period.

Sincerely,

J. Michael Becher
Appalachian Mountain Advocates
P.O. Box 507
Lewisburg, WV 24901
(304) 382-4798
mbecher@appalmad.org

James M. Hecker
Public Justice
1825 K Street NW, Suite 200
Washington, DC 20006
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jhecker@publicjustice.net

Counsel for:

Ohio Valley Environmental Coalition
P.O. Box 6753
Huntington, WV 25773
(304) 522-0246

The Sierra Club
85 Second Street, 2d Floor
San Francisco, CA 94105-3441
(415) 977-5680

West Virginia Highlands Conservancy
P.O. Box 306
Charleston, WV 25321
(304) 924-5802

West Virginia Rivers Coalition
3501 MacCorkle Ave SE Ste. 129
Charleston WV 25304
(304) 637-7201

cc (via certified mail):

Secretary Randy Huffman
West Virginia Department of Environmental Protection
601 57th Street
Charleston, WV 25304

Regional Administrator Shawn M. Garvin
U.S. Environmental Protection Agency Region III
1650 Arch Street
Philadelphia, PA 19103-2029

Administrator Gina McCarthy
U.S. Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Registered Agent
Fola Coal Company, LLC.
CT Corporation System
5400 D Big Tyler Road
Charleston, WV 25313

PUBLIC NOTICE

U.S. ARMY CORPS OF ENGINEERS
PITTSBURGH DISTRICT

1000 Liberty Avenue, Pittsburgh, PA 15222-4186

Notice No. 02-NWP1 | Date: April 8, 2002

NATIONWIDE PERMITS FOR THE STATE OF WEST VIRGINIA

CORPS OF ENGINEERS REGULATORY PROGRAM ISSUANCE OF NATIONWIDE PERMITS

On January 15, 2002, the Corps of Engineers published, in the Federal Register, the final rule for the administration of its nationwide permit program regulations under the Rivers and Harbors Act of 1899, Section 404 of the Clean Water Act, and the Marine Protection, Research and Sanctuaries Act. The rule became effective on March 18, 2002.

An integral part of the Corps' regulatory program is the concept of nationwide permits (NWPs) for minor activities. NWPs are activity specific, and are designed to relieve some of the administrative burdens associated with permit processing for both the applicant and the Federal government. The NWPs, published in the January 15, 2002, Federal Register, Issuance of Nationwide Permits (67 FR 2020), are issued by the Chief of Engineers, and are intended to apply throughout the entire United States and its territories. For convenience, all NWPs with the appropriate regional, general and special conditions are attached.

In response to the Federal Register Notice (67 FR 2020), the West Virginia Department of Environmental Protection (WVDEP) has issued 401 water quality certification, pending compliance with certain conditions and/or limitations, for the following NWPs: 3, 4, 5, 6, 7, 12, 13, 14, 16, 18, 19, 20, 21, 22, 27, 30, 31, 32, 33, 36, 37, 38, 39, 40, 41, and 42.

An individual State Water Quality Certification is required for the following NWPs: 15, 17, 23, 25, 29, 34, and 43. Certification response is not applicable to NWPs: 1, 2, 8, 9, 10, 11, 24, 26, 28, and 35.

Authorization for discharges covered by nationwide permits is denied without prejudice if: (1) the State Certification has been denied; or (2) the discharge is not in compliance with conditions imposed in the State Certification. Applicants wishing to conduct such discharges must first obtain either an individual water quality certificate or waiver from:

Director
West Virginia Department of Environmental Protection
Division of Water Resources
1201 Greenbrier Street
Charleston, West Virginia 25311-1088

Some nationwide permits require advance notification. The notification must be made in writing as early as possible prior to commencing the proposed activity. The notification procedures are located under General Condition 13. The notification to the Corps can be made concurrently with the request for individual state certification, if required.

For activities involving Section 10 of the Rivers and Harbors Act of 1899, the permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

Assistance and further information regarding all aspects of the Corps of Engineers regulatory program may be obtained by contacting:

HUNTINGTON DISTRICT
Name: James M. Richmond, Chief, Regulatory Branch
Address: U.S. Army Corps of Engineers, Huntington District
502 Eighth Street
Huntington, West Virginia 25701-2070
Phone: 304-529-5487

PITTSBURGH DISTRICT
Name: Al Rogalla, Chief Regulatory Branch
Address: U.S. Army Corps of Engineers, Pittsburgh District
William S. Moorhead Federal Building
1000 Liberty Avenue
Pittsburgh, Pennsylvania 15222-4186
Phone: 412-395-7155

Attached is a map showing the district boundaries for the State of West Virginia.

ALBERT H. ROGALLA
Chief, Regulatory Branch

G. West Virginia State 401 Certification Standard Conditions for Nationwide Permits

The following are standard conditions of West Virginia's State 401 Water Quality Certification that apply to the Nationwide Permits. These conditions must be implemented into any activity authorized by a U.S. Army Corps of Engineers Nationwide Permit(s). The State's certification of these Nationwide Permit activities does not replace the need for the applicant proposing an activity under the Nationwide Permit Program from obtaining other applicable permits from the West Virginia Department of Environmental Protection and/or the Division of Natural Resources. These 401 Water Quality Certifications, with all attendant standard conditions and special conditions, are applicable to Corps of Engineers Civil Works Projects in West Virginia.

1. The permittee will investigate for water supply intakes or other activities immediately downstream, which may be affected by suspended solids and turbidity increases caused by work in the watercourse. The permittee will give notice to operators of any such water supply intakes and such other water quality dependent activities as necessary before beginning work in the watercourse in sufficient time to allow preparation for any change in water quality.

2. Excavation, dredging or filling in the watercourse will be done only to the extent necessary to achieve the project's purpose.

3. Spoil materials from the watercourse or onshore operations, including sludge deposits, will not be dumped in the watercourse, or deposited in wetlands or other areas where the deposit may adversely affect the surface or ground waters of the state.

4. The permittee will employ measures to prevent or control spills from fuels, lubricants or any other materials used in connection with construction and restrict them from entering the watercourse. Storage areas for chemicals, explosives, lubricants, equipment fuels, etc., as well as equipment refueling areas, must include containment measures (e.g., liner systems, dikes, etc.) to ensure that spillage of any material will not contact surface or ground waters. Storage areas and refueling areas shall be a minimum distance of 100 feet from any surface water body. Storage and refueling areas must be located outside the West Virginia Division of Health's established wellhead protection zone when domestic water supply wells are present. All spills shall be promptly reported to the State Center for Pollution, Toxic Chemical and Oil Spills, 1-800-642-3074.

5. Upon completion of earthwork operations, all fills in the watercourse or onshore and all other areas onshore disturbed during construction will be properly stabilized to prevent soil erosion. Where possible, stabilization shall incorporate revegetation using bioengineering as an alternative to rip rap. If rip rap is utilized, it is to be of such weight and size that bank stress or slump conditions will not be created due to its placement. Fill is to be clean, nonhazardous and of such composition that it will not adversely affect the biological, chemical or physical properties of the receiving waters. To reduce potential slope failure and/or erosion

behind the material, fill containing concrete must be of near equal dimensions (i.e., length and width shall be similar to material thickness). Concrete sections from demolition projects greater than eighteen (18) inches in diameter and tires are not suitable materials. Rebar or wire in concrete should not extend further than one (1) inch.

6. Runoff from any storage areas or spills will not be allowed to enter storm sewers without acceptable removal of solids, oils and toxic compounds. Discharges from retention/detention ponds must comply with permit requirements of the National Pollutant Discharge Elimination System permit program of the West Virginia Department of Environmental Protection, Division of Water Resources.

7. Best Management Practices for Sediment and Erosion Control, as described in the U.S. Department of Agriculture, Natural Resource Conservation Service (NRCS), Sediment and Erosion Control Handbook for Developing Areas of West Virginia, or similar documents prepared by the West Virginia Division of Highways or West Virginia Department of Environmental Protection's, Division of Mines and Reclamation may be used where the proposed land disturbance is less than three (3) acres in size. These handbooks are available from the respective agency offices. Land disturbances, which are integral to the completion of the permitted activity and are three (3) acres or greater in total area, must comply with the National Pollutant Discharge Elimination System stormwater permit requirements as established by the West Virginia Department of Environmental Protection, Division of Water Resources.

8. Green concrete will not be permitted to enter the watercourse unless contained by tightly sealed forms or cells. Concrete handling equipment shall not discharge waste washwater into wetlands or watercourses at any time without adequate wastewater treatment as approved by the West Virginia Department of Environmental Protection, Division of Water Resources.

9. Instream work is not permissible during the warm water fish spawning season, April through June, except as may be authorized by the West Virginia Department of Environmental Protection, Division of Water Resources, and the West Virginia Division of Natural Resource, Wildlife Resources Section.

10. Removal of mature riparian vegetation not directly associated with the project construction is prohibited. Disturbance and removal of vegetation from project construction area is to be avoided, where possible, and minimized when necessary. Removal of vegetation shall not be allowed where stream bank stability under normal flow conditions would be compromised.

11. Operation of equipment instream is to be minimized and accomplished during low flow periods when possible. Ingress and egress for equipment shall be within the work site. Location of ingress and egress outside the immediate work area requires prior approval of the WVDEP and/or WVDNR.

12. Each permittee shall, if they do not understand or are not aware of applicable Nationwide Permit conditions, contact the Corps of Engineers prior to conducting any activity authorized by a Nationwide Permit in order to be advised of applicable conditions.

13. The permittee will comply with water quality standards as contained in the West Virginia Code of State Regulations, Requirements Governing Water Quality Standards, Title 46, Series 1.

14. Activities permitted under the Nationwide Permit Program require that a West Virginia Public Lands Corporation Right of Entry be obtained. Application for this permit should be made to the West Virginia Division of Natural Resources, Office of Real Estate Management, Capitol Complex, Building 3, Room 643, Charleston, West Virginia 25305.

15. The deposit of dredged or fill materials in island backchannels, embayments or stream mouths is not certified for any of the Nationwide Permits. Stream mouth is defined as extending 100 *feet* upstream from the confluence with receiving stream.

16. This Standard Condition requires an Individual State Water Quality Certification for Nationwide Permits; 3(iii), 7, 21, 27, 33, and 39 for work in any of the rivers or streams listed in Sections A through F below. Prior written notification to the West Virginia Division of Water Resources is required for use of Nationwide Permits 6, 12, 13, 14, 16,17,18,19, 40, 41, and 42 in any of the streams listed in Sections A through F as follows, except as may be provided for in the individual nationwide permit:

    A. 'Waters of Special Concern' – include all of those waters listed in Appendix A of 60 CSR 5, Waters of Special Concern, including but not limited to, naturally reproducing trout streams, federally designated rivers under the Wild and Scenic Rivers Act, 16 U.S.C. §§ 1271 et. seq., waters in state parks and forests, waters in National Parks and Forests, waters designated under the National Parks and Recreation Act of 1978, and waters with unique or exceptional aesthetic, ecological, or recreational value.

    B. All Federally designated rivers under the Wild and Scenic Rivers Act, Public law 95-542, as amended, 16 U.S.C. 1271, et seq (Bluestone River from the upstream boundary of Pipestem State Park to Bluestone Reservoir, Meadow River from near the US 19 bridge to its junction with the Gauley River, also included are all rivers within the Monongahela National Forest designated as National Wild and Scenic Study Rivers);

    C. All naturally reproducing trout streams in the following counties; Barbour, Fayette, Grant, Greenbrier, Hampshire, Hardy, Mercer, Mineral, Monroe, Nicholas, Pendleton, Pocahontas, Preston, Raleigh, Randolph, Summers, Tucker, Upshur and Webster, for information about specific

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF WEST VIRGINIA
AT HUNTINGTON

OHIO VALLEY ENVIRONMENTAL COALITION, WEST VIRGINIA HIGHLANDS CONSERVANCY, and SIERRA CLUB,

Plaintiffs,

v.

CIVIL ACTION NO. 2:13-cv-21588

FOLA COAL COMPANY, LLC,

Defendant.

STIPULATION OF THE PARTIES

Plaintiffs and Defendant, by their counsel, stipulate to the correctness of the facts set forth in paragraphs 1-48 below and the authenticity and correctness and admissibility of the documents listed in Attachment B. With respect to data collected by the WVDEP or other third parties, the Plaintiffs and Defendant agree that the data contained in this stipulation accurately reflects the reported results from those third parties; this Stipulation does not reflect an agreement as to the adequacy or accuracy of test methods and procedures used by third parties and should not be construed as a waiver of any challenge to the adequacy or accuracy of those results.

Respectfully submitted,

/s/Matthew S. Tyree
Matthew S. Tyree (WVBN 11160)
Robert G. McLusky (WVBN 2489)
Jackson Kelly PLLC
1600 Laidley Tower
P.O. Box 553
Charleston, WV 25322

Counsel for Defendant

Respectfully submitted,

/s/ J. Michael Becher
J. Michael Becher (W.Va Bar No. 10588)
Appalachian Mountain Advocates
P.O. Box 507
Lewisburg, WV 24901
304-382-4798
mbecher@appalmad.org

James M. Hecker
Public Justice
1825 K Street, N.W.
Washington, DC 20006

Counsel for Plaintiffs

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF WEST VIRGINIA
AT HUNTINGTON

OHIO VALLEY ENVIRONMENTAL
COALITION, et al.,

Plaintiffs,

v.

Civil Action No. 2:13-cv-21588

FOLA COAL COMPANY, LLC, et al.,

Defendants.

CERTIFICATE OF SERVICE

I hereby certify that a copy of the Stipulation of the Parties was filed via the Courts CM/ECF system which will provide electronic notification to the following:

Shane Harvey
Matthew S. Tyree
Jackson Kelly PLLC
1600 Laidley Tower
PO Box 553
Charleston, WV 25322

/s/ J. Michael Becher
J. Michael Becher (W. Va. Bar No. 10588)
Appalachian Mountain Advocates
P.O. Box 507
Lewisburg, WV 24901
Telephone: (304) 382-4798
Fax: (304) 645-9008

Counsel for Plaintiffs

ATTACHMENT A

1. Fola owns and operates three surface coal mines along three tributaries of Leatherwood Creek in Clay and Nicholas Counties, West Virginia. In order from downstream to upstream, they are Fola Surface Mine No. 4A in the Right Fork watershed, Fola Surface Mine No. 2 in the Road Fork watershed, and Fola Surface Mine No. 6 in the Cogar Hollow watershed. The relative position of the three mines is shown in Figure 1 below. Leatherwood Creek flows from the lower right to the upper left to the north of the three mines.

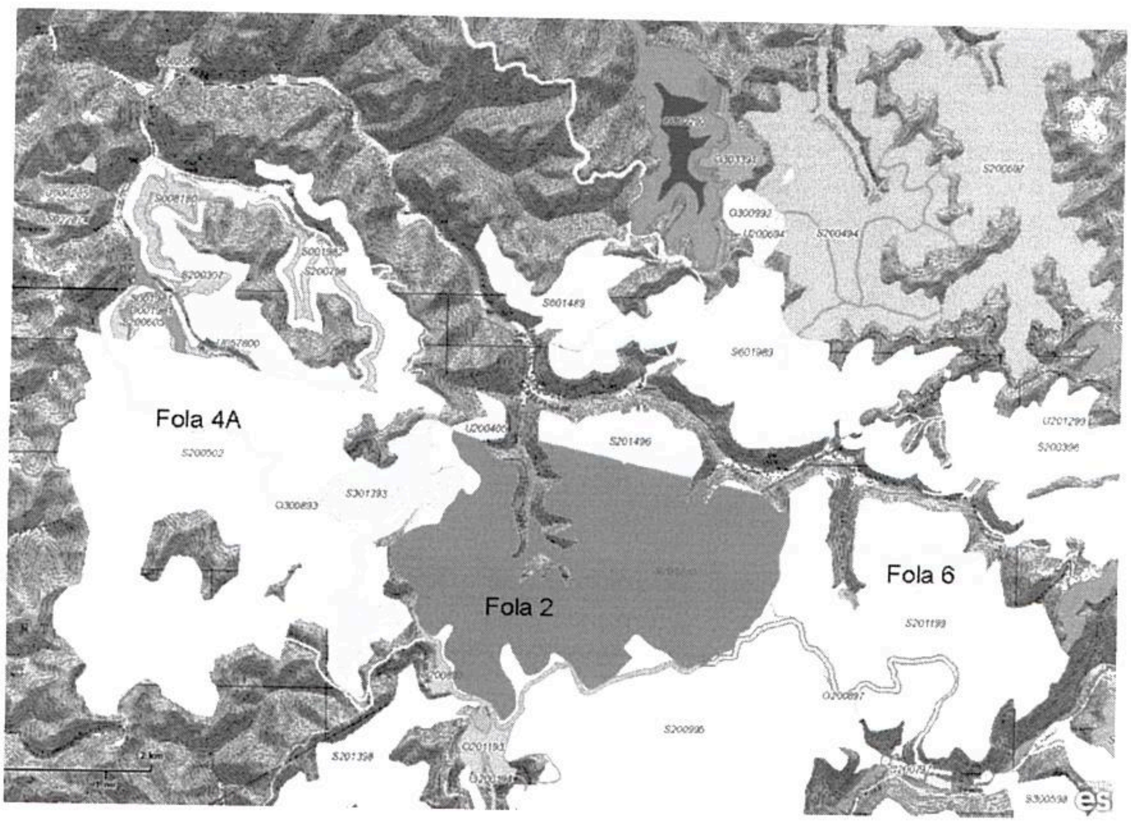


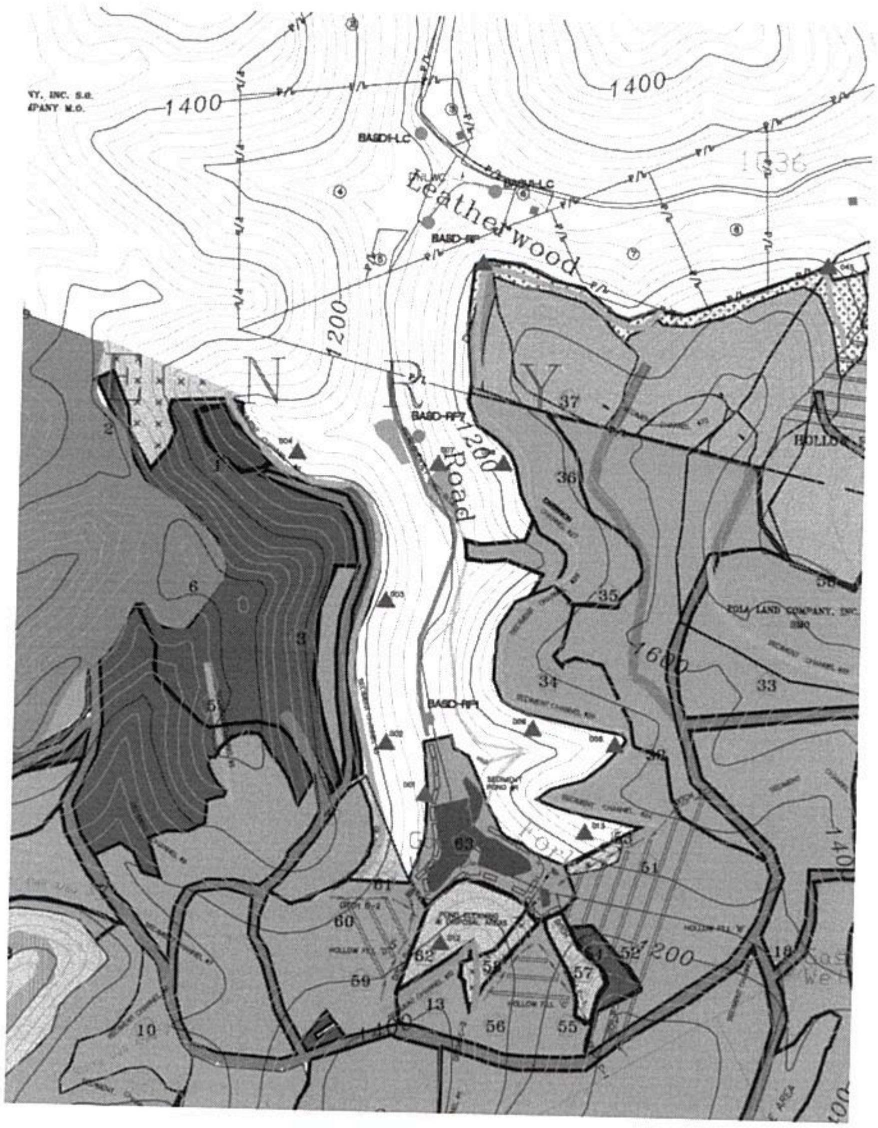
Figure 1. Topographic map of Fola Surface Mines 4A, 2 and 6 and Leatherwood Creek. (from: WVDEP http://tagis.dep.wv.gov/mining/).

Fola Surface Mine No. 2

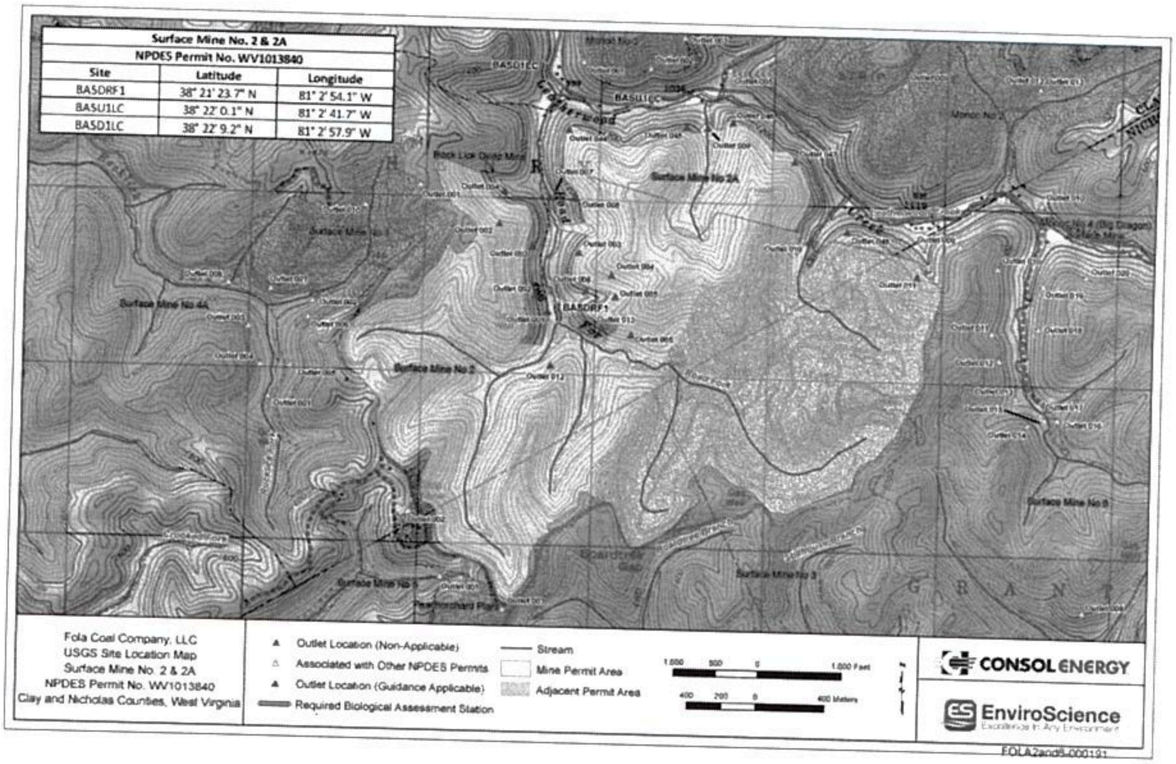
2. Fola Coal Company, LLC (Fola) owns and operates Surface Mine #2 in Clay and Nicholas Counties, West Virginia.

3. The mine area contains three valley fills (B, C, and D) that partially fill the Road Fork watershed. These fills discharge into Pond #1, which discharges from Outlet 001 into Road Fork, which flows into Leatherwood Creek, which is a tributary of the Elk River. Outlet 001 is upstream from monitoring point DNRF in Road Fork. WV1013840 2007 Permit Application, Flow Chart, p. 8, DOC1.

4. The following map shows the valley fill locations, with VFB to the east, VFC to the south, and VFD to the west at the upstream limit of Road Fork (WV1013840 NPDES Reissuance/GPP map, FOLA2and6-000101, DOC2 (excerpt)):



5. The following map shows the outlet locations (2013 EnviroScience Report, p. 4, FOLA2and6-000191, DOC3):



6. Fola holds West Virginia Surface Mining Permit No. S201293 and WV/NPDES Permit No. WV1013840 for Surface Mine No. 2.

7. Fola's current WV/NPDES permit WV1013840, issued in 2014, limits discharges at Fola's Surface Mine No. 2 from Outlet 001 that flow into Road Fork and Leatherwood Creek. WV/NPDES permit, DOC4.

8. Fola's current WV/NPDES permit WV1013840 contains bio-monitoring criteria. Id. The permit requires Fola to conduct annual benthic surveys at the following biological monitoring stations: BASD-RF1 (38° 21' 23.7000" latitude; 81° 02' 54.1000" longitude); BASD1-LC (38° 22' 09.2000" latitude; 81° 02' 57.9000" longitude); and BASU1-LC (38° 22' 00.1000" latitude; 81° 02' 41.7000" longitude). Id. Fola is also required to take corresponding habitat assessment scores for the benthic stations and concurrent in-stream samples for specific conductivity, total dissolved solids, pH, sulfate, alkalinity, calcium, magnesium, sodium and

potassium. Id. Fola must provide the aforementioned information to WVDEP within 90 days of conducting the benthic surveys. Id.

9. Fola's current WV/NPDES permit WV1013840 contains a reopener clause stating that "[t]his permit may be reopened and modified, suspended, revoked and reissued or revoked at any time if information becomes available and demonstrates that the established controls do not attain and maintain the narrative water quality criteria at 47 CSR 3.2.e and 47 CSR 3.2.i." Id.

10. Outlet 001 is "the only major drainage feeding Leatherwood Creek from this permit." WV1013840 2007 Permit Application, p. 14, DOC1.

11. Fola's current West Virginia Surface Mining Permit No. S201293 was renewed in 2014 and expires on July 20, 2019. WV/SMCRA Permit, DOC5.

12. In samples taken between July 1992 and July 1993, prior to mining, Fola measured the following levels of conductivity (in µS/cm) and sulfate (in mg/l) at the S-3/DNRF monitoring point, which is downstream from Outlet 001 and upstream from the confluence of Road Fork with Leatherwood Creek (S201293 1994 Permit Application, Baseline Surface Water Monitoring Data, p. 656, DOC7):

Date	Conductivity	Sulfate	Flow (cfs)
7/27/1992	49	14	
7/27/1992	43	11	
8/26/1992	43	0.01	0.11
8/26/1992	43	11	0.11
9/2/1992	46	8	0.18
10/7/1992	58	9	0.03
11/19/1992	40	3	0.03
12/7/1992	49	5	0.08
1/13/1993	73	30	0.13

13. In 2010-12, Fola measured the following levels of conductivity and sulfate at this same location, S-3/DNRF (WV1013840 Art 3 analysis, DOC9):

Date	Conductivity	Sulfate	Flow (cfs)
1/13/2010	4160	1852	0.488
2/4/2010	4400	1810	0.622
3/4/2010	2415	1310	0.448
4/15/2010	5700	3304	0.642
5/3/2010	2830	1437	0.644
6/1/2010	4070	2090	0.689
7/8/2010	4390	2552	0.442
8/2/2010	4610	1996	0.421
9/16/2010	4960	2188	0.422
10/15/2010	4680	2069	0.442
11/4/2010	4480	2040	0.466
12/1/2010	1821	886	0.688
1/18/2011	3840	1795	0.441
2/2/2011	3820	1091	0.688
3/1/2011	1803	1042	0.688
4/5/2011	3420	1679	0.688
5/4/2011	3230	1628	0.442
6/8/2011	4630	1383	0.344
7/12/2011	3290	2079	0.644
8/8/2011	4650	2164	0.686
9/6/2011	2920	1457	0.889
10/4/2011	3460		0.688
11/10/2011	4410		0.446
12/1/2011	4140		0.844
1/11/2012	4260	1703	0.622
2/8/2012	4000	1365	0.642
3/5/2012	2520	1561	0.844
4/5/2012	3720	2099	0.446
5/9/2012	3820	1697	0.668
6/12/2012	4260	2006	0.442
7/3/2012	4880	2196	0.468
8/7/2012	3860	1873	0.466
9/5/2012	3220	1531	0.542

14. Monitoring data since 2002 from Outlet 001, which drains the three valley fills B,C, and D, show that the discharged water from that outlet contained the following levels of conductivity and sulfate (WV1013840 2000 Permit Application, DOC10; WV1013840 2003

Permit Application, DOC11; WV1013840 2007 Permit Application, DOC1; WV1013840 Outlet 001 Analysis, DOC12; WV1013840 Art 3 Analysis2, DOC13):

Date	Conductivity	Sulfate	Flow (gpm)	Cite
1/13/1999		96		2000 NPDES permit app p. 19
9/3/2002		1300		2003 NPDES permit app p. 13A
11/2/2006	3290	419		2007 NPDES permit app pp. 15, 18
10/5/2011	2560		89	FOLA2and6-002557
10/17/2011	2920		90	FOLA2and6-002557
11/1/2011	2970		90	FOLA2and6-002557
11/11/2011	3310		90	FOLA2and6-002557
12/2/2011	4470		90	FOLA2and6-002557
12/15/2011	2850		90	FOLA2and6-002557
1/2/2011	2910		93	FOLA2and6-002556-57
1/12/2012	3140		92	FOLA2and6-002556-57
2/1/2012	3210		90	FOLA2and6-002556-57
2/14/2012	2060		92	FOLA2and6-002556-57
3/5/2012	2830		95	FOLA2and6-002556-57
3/15/2012	3070		93	FOLA2and6-002556-57
4/2/2012	3280		92	FOLA2and6-002556-57
4/12/2012	3380		94	FOLA2and6-002556-57
7/2/2012	2920		90	WV1013840 Art 3 analysis
7/12/2012	3400		87	WV1013840 Art 3 analysis
8/2/2012	2580		88	WV1013840 Art 3 analysis
8/15/2012	3070		88	WV1013840 Art 3 analysis
9/6/2012	3110		85	WV1013840 Art 3 analysis
9/17/2012	3150		84	WV1013840 Art 3 analysis

15. On January 13, 1999 and July 26, 2002, Fola sampled the raw water discharged from the three valley fills for its 2000 and 2003 NPDES permit applications (DOC10, p. 30 and DOC11, pp. 14-17, respectively) and measured the following:

Date	Location	Conductivity	Sulfate
1/13/1999	Valley Fill B		1360
1/13/1999	Valley Fill D		80
7/26/2002	Valley Fill B	5246	1200
7/26/2002	Valley Fill C	5120	1050
7/26/2002	Valley Fill D	2940	1050

16. In Spring 2011, 2012, 2013, and 2014, Fola's consultants, REI Consultants, Inc., and EnviroScience, Inc., conducted biological, physical, and chemical sampling in Road Fork and Leatherwood Creek. WV1013840 2011 REI Report, DOC17; WV1013840 2012 EnviroScience Report, DOC18; WV1013840 2013 EnviroScience Report, DOC19; WV1013840 2014 EnviroScience Report, DOC48. The sampling sites are as follows (id., DOC19, p. 4):

Table 1.0 Surface Mine 2 & 2A Site and Descriptions

NPDES No. WV1013840				
Site Name	**Benthic Sampling Date**	**Stream**	**Description**	**Coordinates**
BASDRF1	05/20/2013	Road Fork	Just downstream of Outlet 001	38° 21' 23.7" N 81° 2' 54.1" W
BASU1LC	05/20/2013	Leatherwood Creek	Upstream of the confluence with Road fork	38° 22' 0.1" N 81° 2' 41.7" W
BASD1LC	05/20/2013	Leatherwood Creek	Downstream of the confluence with Road Fork	38° 22' 9.2" N 81° 2' 57.9" W

17. The chemical sampling, RBP scores, and WVSCI scores at these three sites were as follows (DOC17, pp. 25; DOC18, pp. 11-12, 15; DOC19, pp. 10, 12, 16; 2011 REI WQS Report App. E, p. 16, DOC20; WV1013840 2014 EnviroScience Report, DOC48):

Parameter	Date	Downstream of Outlet 001	Upstream of Road Fork on LWC	Downstream of Road Fork on LWC
Conductivity	5/24/2011	3200	2110	2350
Conductivity	5/21/2012	2700	2500	2280
Conductivity	5/20/2013	2530	1800	2010
Conductivity	5/19/2014	2710	2000	2120
Sulfate	5/24/2011	1860	1020	1230
Sulfate	5/21/2012	1860	1360	1600
Sulfate	5/20/2013	1970	1200	1420
Sulfate	5/19/2014	1620	1130	1230
WVSCI	5/24/2011	46.43	40.61	46.62
WVSCI	5/21/2012	50.1	39.6	42.2
WVSCI	5/20/2013	43.25	39.7	45
WVSCI	5/19/2014	56.8	34.7	37.9
RBP	5/24/2011	119	93	115
RBP	5/21/2012	124	147	146

RBP	5/20/2013	124	144	146
RBP	5/19/2014	123	143	146

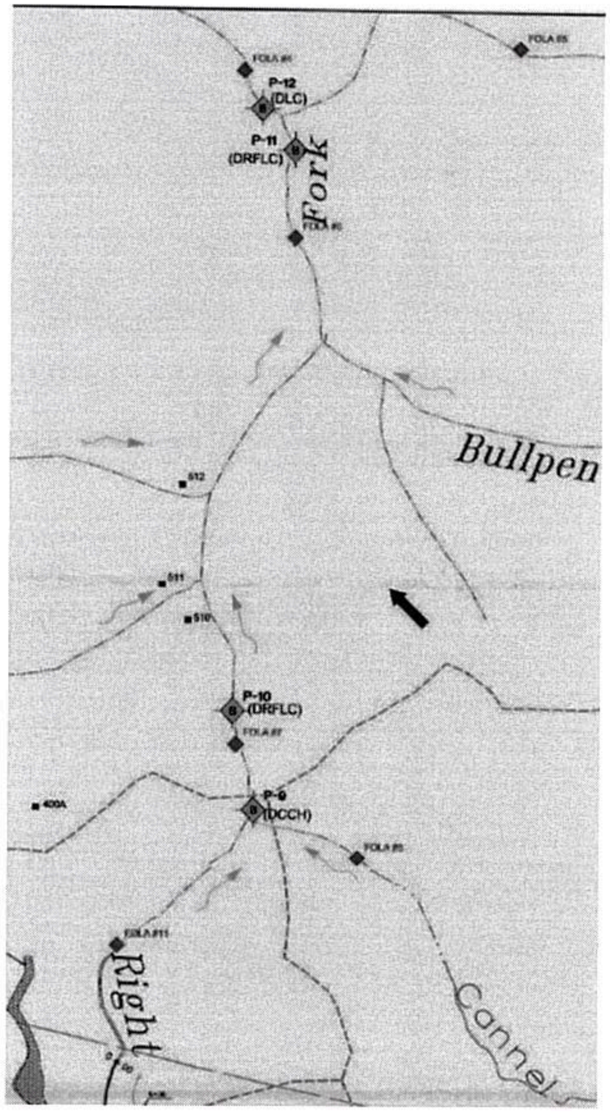
18. Monitoring data show the following levels of constituents in Outlet 001 samples taken by Fola in November 2006 (WV1013840 2007 Permit Application, DOC1), in BASD-RF1 samples taken by Fola in Road Fork 250 feet downstream from Outlet 001 in 2011-2014 (FOLA2and6-000022, 000024, 000092, 000125, 000184, 000204, 002648, DOC49):

Location	pH	Conduct-ivity	Alkalinity (CaCO3)	Hardness (CaCO3)	Ca	Mg	Na	K	Cl	SO4
Road Fork Outlet 001 (11/06)	8.28	3290	143	2175	358	310	12	n/a	2	419
Road Fork BASD-RF1 (5/24/11)	7.8	3200	125	2540	385	382	11.9	10.7	18.5	1860
Road Fork BASD-RF1 (5/21/12)	7.98	2700	139	n/a	370	356	11.8	22.2	n/a	1860
Road Fork BASD-RF1 (5/20/13)	8.1	2530	127	n/a	330	320	12.7	19.1	n/a	1970
Road Fork BASD-RF1 (5/19/14)	7.93	2710	145	n/a	320	292	10.6	17.7	n/a	1620

Fola Surface Mine No. 4A

19. Fola owns and operates Surface Mine No. 4A in Clay County, WV. The mine covers 1743 acres of the total of 10,321 acres in the Leatherwood Creek watershed above threshold monitoring point P-12, or about 17% of the total acres. S200502 CHIA, p. 6, DOC21.

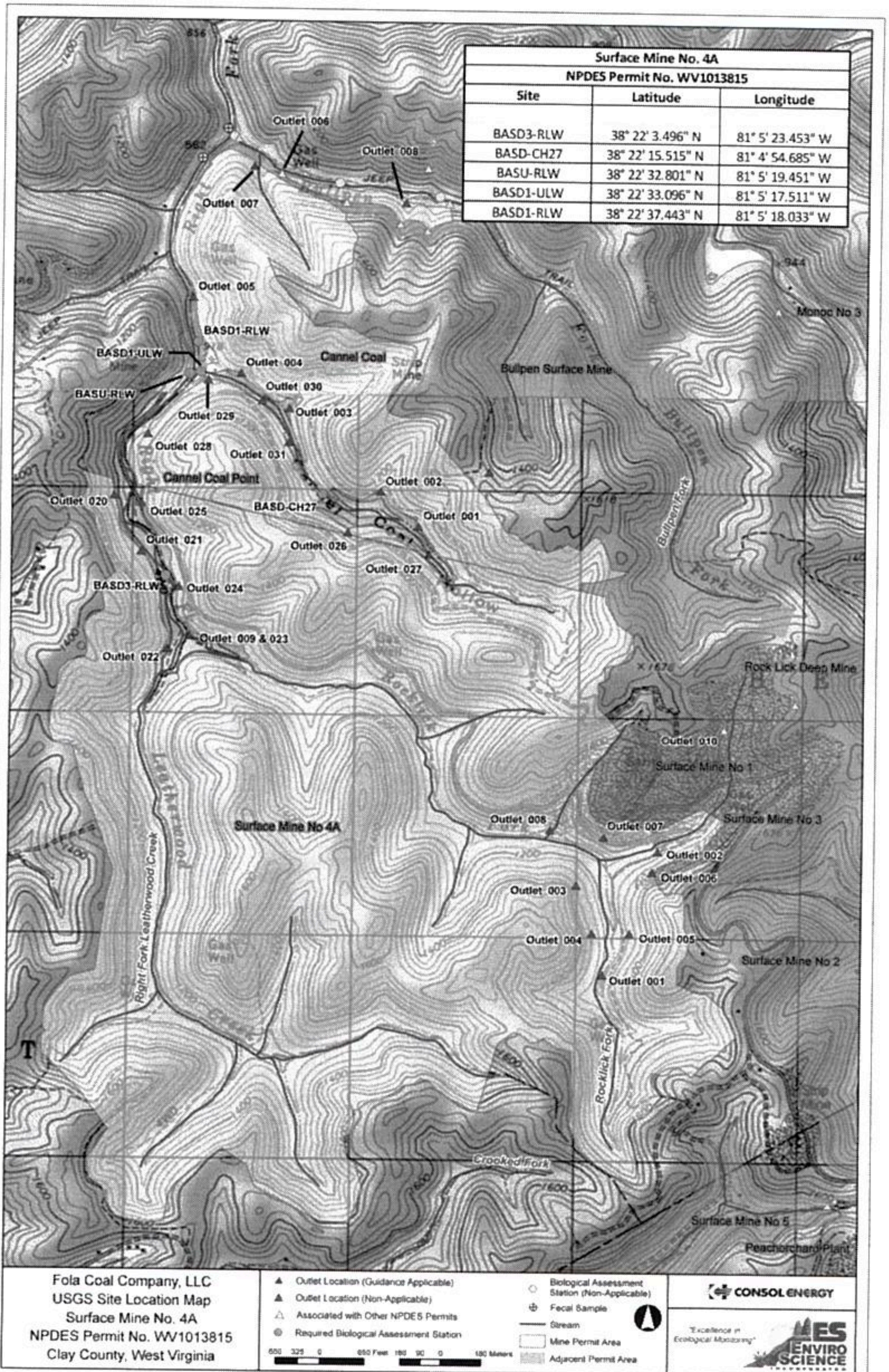
20. Point P-12 is on Leatherwood Creek below its confluence with the Right Fork of Leatherwood Creek. P-11 is near the mouth of Right Fork. P-10 is on Right Fork below Cannel Coal Hollow. P-9 is near the mouth of Cannel Coal Hollow. These points are shown below (Stream Delineation Map, DOC22):



21. Runoff from the mine area drains into channels and ponds that discharge from Outlets 022, 023, and 027, which flow into Right Fork of Leatherwood Creek, which is a tributary of the Elk River. Outlet 022 discharges into Right Fork of Leatherwood Creek. Outlet 023 discharges into Rocklick Fork, a tributary of Right Fork. Outlet 027 discharges into Cannel Coal Hollow, which also flows into Right Fork. WV1013815 Drainage Map, DOC23; S200502 Flow Diagram, DOC24.

22. The mine and outlet locations are shown on the following map, which shows that Surface Mine No. 4A covers the large majority of the Right Fork watershed upstream of its

confluence with Bullpen Hollow, and includes most of the watershed for two tributaries into Right Fork—Rocklick Fork and Cannel Coal Hollow (Fola SM 4A Site Location Map, DOC25):



FOLA#4A000841

23. Fola holds West Virginia Surface Mining Permit No. S200502 and WV/NPDES Permit WV1013815 for Surface Mine No. 4A.

24. Fola's current WV/NPDES permit WV1013815, issued on January 17, 2014, limits discharges at Fola's Surface Mine No. 4A from Outlets 022, 023, and 027. WV/NPDES Permit, DOC26.

25. Fola's current WV/NPDES permit WV1013815 labels Outlets 022, 023, and 027 as "substantially complete." Id.

26. Fola's current WV mining permit for Surface Mine No. 4A was renewed on February 11, 2014. WV/SMCRA Permit, DOC27.

27. Fola's mine plan for Surface Mine No. 4A called for it to mine through streams, disturb 28,239 feet of streams, construct ponds, and not use any valley fills. 2003 NWP 21 Authorization, DOC28. Fola expected to generate 451 million cubic yards of spoil material. S200502 2002 AOC Process Report, DOC29. Fola removed the natural streams onsite and shifted them both horizontally and vertically from their original positions. S200502 2003 Project Purpose Statement, DOC30.

28. Fola measured the baseline water quality in 1999-2000 prior to beginning Surface Mine No. 4A. S200502 2003 Permit Application, pp. 25.181, 25.191 to 25.193, DOC31. The sampling included points P-9 (DCCH), P-10 (DRFLC), and P-11 (DRFLC). Those points are shown on the map in paragraph 22 above. The results of the sampling are shown below:

	P-9			P-10			P-11		
Date	Cond	Sulf	Flow	Cond	Sulf	Flow	Cond	Sulf	Flow
10/31/00	307	90	0.10	1156	440	0.52			
9/29/00	218	74	0.21	406	112	0.89	638	148	0.93
8/31/00							538	48	0.91
8/30/00	128	44	0.41	550	140	1.36			
7/28/00							732	180	0.93
7/19/00	1392	200		1560	186	1.05			

6/30/00	516	120	0.49	767	148	1.26			
6/22/00							343	88	1.83
5/26/00							627	180	0.56
5/19/00	1180	480	0.25	1180	440	1.01			
4/29/00							76	17	0.83
4/27/00	279	76	0.29	207	74	1.06			
3/30/00							464	152	1.09
3/28/00	35	25	0.31	384	128	1.07			
2/25/00							366	100	0.93
2/21/00	180	62	0.46	168	45	1.39			
1/27/00							603	280	0.71
1/26/00	241	75	0.13	354	78	0.64			
12/31/99							650	200	0.86
12/29/99	212	80	0.79	336	80	0.09			
11/30/99	375		0.11	365		0.87	549	155	0.71
10/27/99							813	340	0.71
10/25/99				870	300	0.65			
9/14/99	317	88	0.16				779	250	0.52

29. Potesta & Associates conducted biological surveys from Fall 1999 to Spring 2001 prior to the commencement of Surface Mine No. 4A at the following sampling points (WV1013815 Biological Survey, DOC32, at p. FOLA#4A001826; S200502 2001 Potesta Report, pp. 2-3, DOC33):

FOLA-4 Leatherwood Creek- downstream (DS) Mouth of the Right Fork of Leatherwood
FOLA-5 Leatherwood Creek- upstream (US) of the confluence with the Right Fork of Leatherwood
FOLA-6 Right Fork of Leatherwood Creek- mouth
FOLA-7 Right Fork of Leatherwood Creek- DS Cannel Coal unnamed tributary (UNT)
FOLA-8 Cannel Coal Hollow Mouth (UNT) - Mouth
FOLA-9 Cannel Coal Hollow (UNT)
FOLA-10 Cannel Coal Hollow (UNT) - Headwaters
FOLA-11 Right Fork of Leatherwood Creek- US Cannel Coal UNT
FOLA-12 Right Fork of Leatherwood Creek- Above confluence with Rocklick
FOLA-13 Right Fork of Leatherwood Creek- DS FOLA-16 / US FOLA-12
FOLA-14 Mouth of the 4m UNT of the Right Fork of Leatherwood Creek
FOLA-15 Right Fork of Leatherwood Creek- Headwaters
FOLA-16 Mouth of the 5tn UNT of the Right Fork of Leatherwood Creek
FOLA-17 Rocklick- US confluence with Right Fork of Leatherwood Creek
FOLA-18 Rocklick- Below Pond #4
FOLA-19 Rocklick- Above the confluence of Pond #4
FOLA-20 UNT of Rocklick- above FOLA-19 at end of road

30. Points Fola-4 through Fola-20 were located in the Right Fork of Leatherwood Creek sub-watershed and surrounding areas. Points Fola-4 through Fola-7 are shown on the map in paragraph 22 above. DOC22. FOLA-6 is close to and upstream of Station P-11, and FOLA-7 is close to and upstream of Station P-10. Id.

31. Potesta reported the following results from its biological surveys of the Surface Mine No. 4A area (WV1013815 Biological Survey, DOC32, at FOLA#4A001828; S200502 2001 Potesta Report, pp. FOLA#4A001877, 1879, 1890-91, 1925, 1988-89, 2020-2027, DOC33):

Site	WVSCI		Conductivity		RBP	Fish Data	
	Fall 2000	Spring 2001	Fall 2000	Spring 2001	Fall 2000	Spring 2000	Spring 2001
Fola-4	70	57	1560	847	154	23	14
Fola-5	53	35	1825	1048	132	14	11
Fola-6	86	59	742	461	131		
Fola-7	69	70	717	367	140	4	6
Fola-8	90	92	251	197	124		
Fola-9	89	91	110	80	150	1	1
Fola-10	89	86	90	70	140		
Fola-11	70	56	750	397	141		
Fola-12	85	68	80	59	148	3	3
Fola-13	88	92	100	46	144		
Fola-14	77	80	80	38	117		
Fola-15	94	92	70	48	160	2	2
Fola-16	Dry	67	Dry	39	Dry		
Fola-17	82	79	1620	398	155	2	3
Fola-18	89	78	2093	1048	138	2	2
Fola-19	92	87	2025	943	144		
Fola-20	91	75	95	50	160		

32. Since mining began, Fola has measured the following levels of conductivity and flow (in gpm) in discharges from Outlets 022, 023, and 027 (S200502 Art. 3 Analysis, DOC34):

	Outfall			Cite
Date	022	023	027	FOLA#4A00___

	Cond	Flow	Cond	Flow	Cond	Flow	
8/28/08					2270	73	169
9/19/08					1674	23.8	169
10/5/11	1438	164	2840	152	1934	57	303, 307, 316
10/17/11	1774	160	3490	150	2220	54	303, 308, 316
11/1/11	1730	160	2630	150	3970	57	303, 308, 316
11/11/11	1884	150	2790	140	2420	50	304, 308, 316
12/2/11	1649	165	3450	1.5	2220	52	304, 308, 316
12/13/11	1771	160	3450	150	2210	50	304, 308, 317
1/2/12	1874	160	3570	140	2150	50	352, 357, 366
1/12/12	1791	164	3590	160		0	352, 357,
2/1/12	1817	164	3610	160	624	57	352, 357, 367
2/14/12	1833	160	2840	160	614	57	352, 358, 367
3/5/12	1759	160	2800	155	490	55	353, 358, 367
3/16/12	1683	160	1693	155	2250	55	353, 358, 367
4/2/12	1884	164		0	2300	57	353, 367
4/12/12	1958	164		0	2330	57	353, 368
5/2/12	1914	164	3410	152	2680	57	353, 358, 368
5/14/12	1474	164	2210	152	2080	57	354, 359, 368
6/4/12	1797	160	2760	150	2240	57	354, 359, 368
6/15/12	1855	150	2840	140	2230	50	354, 359, 368
7/2/12	1848	150	2800	130	2240	50	354, 359, 369
7/12/12	1944	150	2890	140	2300	50	354, 360, 369
8/2/12	1848	160	2370	150	1379	55	355, 360, 369
8/15/12	1690	160	3540	130	2070	40	355, 360, 369
9/6/12	1886	170	3430	140	2360	40	355, 360, 370
9/24/12	1594	170	2710	140	1756	40	355, 360, 370
10/3/12	2270	170	2680	140	2010	45	356, 361, 370
10/24/12	1785	170	2280	140	2210	45	356, 361, 370
11/5/12	1949	180	2880	170	1796	50	356, 361, 370
11/15/12	1798	170	2850	170	2040	50	356, 361, 371
12/4/12	1789	160	2840	170	2360	60	356, 361, 371
12/14/12	1876	1.7	2960	120	2490	60	357, 362, 371
1/4/13	1577	160	2790	150	2120	60	409, 410, 413
1/14/13	1584	160	2800	160	2130	60	409, 411, 414
2/4/13	1782	160	2440	160	1957	60	409, 411, 414
2/15/13	1146	170	3330	170	2870	80	409, 411, 414
3/1/13	3920	170	4180	170	3200	80	410, 411, 414
3/11/13	4750	160	3130	160	3450	80	410, 412, 414
4/1/13	1593	160	2629	160	1490	80	410, 412, 415
4/11/13	1703	160	2898	160	2295	80	410, 412, 415

33. Fola has measured the levels of conductivity and sulfate downstream from Outlets 022, 023, and 027 at monitoring points DCCH (P-9), DRFLC (P-10) and DRFLC (P-11), which are shown in the map in paragraph 22 above (S200502 Art. 3 Analysis, DOC35):

Date	DCCH Cond	DCCH Sulf	DRFLC P-10 Cond	DRFLC P-10 Sulf	DRFLC P-11 Cond	DRFLC P-11 Sulf	Cite FOLA#4A000___
5/15/08			705	368	1334	735	177, 180
6/12/08			1214	618	1630	827	178, 180
7/16/08			1360	700	1643	862	178, 181
8/15/08	1106	618	1636	867	2700	1442	170, 181, 184
8/26/08	1209	742	1836	1031	2980	1691	171, 181, 184
9/10/08	1237	798	1756	1126	1723	1163	171, 182, 185
10/15/08	1359	781	1716	812	3320	1721	171, 182, 185
11/14/08	1224	688	1964	918	1752	870	171, 183, 185
11/25/08	1224	675	1950	962	1750	871	172, 183, 185
12/11/08	614	225	1065	491	1005	445	172, 183, 185
12/31/08	918	505	1779	808	1628	965	172, 184, 186
1/13/09	757	300	1667	894	1496	782	211-12, 226, 232
1/26/09	514	77	1385	803	1093	385	212, 226-27, 232
2/4/09	746	346	1850	985	1306	660	212, 227, 233
2/16/09	935	519	1871	1036	1600	886	212, 227, 233
3/10/09	904	509	1877	1008	1578	819	212, 228, 233
4/9/09	746	369	1694	900	1308	673	213, 228, 233
5/6/09	654	314	1442	737	1081	550	213, 229, 234
6/11/09	1000	477	1630	764	1430	719	213, 229, 234
7/7/09	1311	742	3290	1236	1989	1116	213, 230, 234
8/12/09	688	325	1208	618	1036	516	214, 230, 234
9/3/09	1028	565	1959	1120	1977	993	214, 231, 235
10/6/09	1097	593	3320	1246	1917	1101	214, 231, 235
11/6/09	1010	488	3130	1049	1772	870	214, 231, 235
12/3/09	992	522	1496	782	1378	6	215, 232, 235-36
1/13/10	1056	564	2770	1096	1728	1505	266, 280, 285
2/4/10	961	492	1967	1144	1645	890	266, 281, 285
3/4/10	1113	509	2809	1085	1592	1022	266, 281, 286
4/15/10	1235	676	2950	1267	1860	1065	267, 281, 286
5/3/10	986	495	1296	653	1042	504	267, 282, 286
6/1/10	1417	824	2900	1196	1884	1056	267, 282, 286
7/8/10	1452	963	3120	1308	2720	1412	267, 283, 286-87
8/2/10	1188	640	2390	1074	1902	1003	268, 283, 287
9/16/10	1638	888	2920	1498	2840	1337	268, 283, 287

10/15/10	1458	776	3140	1276	2830	1219	268, 284, 287
11/4/10	1156	606	2690	1129	1806	964	268, 284, 287
12/1/10	894	420	1263	575	1204	573	269, 285, 288
1/18/11	1272	656	3140	822	1863	881	317, 332, 337
2/2/11	900	481	1733	952	1368	706	317, 332, 337
3/1/11	670	311	1434	726	1042	495	317, 333, 337
4/5/11	1100	567	2980	1221	1739	960	318, 333, 338
5/4/11	1796	980	2790	1869	1631	925	318, 333, 338
6/8/11	3260	1257	2840	897	2370	1180	318, 334, 338
7/12/11	1288	618	1912	1017	1836	882	318, 334, 338
8/8/11	1520	840	2840	1263	1848	1017	318, 335, 338-39
9/6/11	1284	623	1809	751	1605	717	319, 335, 339
10/4/11	1302	662	1959	1088	1780	977	319, 331, 335, 339
11/10/11	2700	1030	2940	1339	2580	1277	319, 336, 339
12/1/11	1720	976	2780	1159	1744	918	319, 331, 336, 339
1/11/12	1802	954	2880	1264	2010	1083	371, 384, 388, 394
2/8/12	1686	871	2210	1179	1826	1031	371-72, 384, 388, 394
3/5/12	1328	1032	1820	815	1499	488	372, 384, 388, 394
4/5/12	2990	1192	3240	1321	1898	1073	372, 385, 390, 395
5/9/12	1632	852	1912	977	1619	814	372, 385, 390, 395
6/12/12	1868	939	3010	1494	2250	1183	372, 385, 391, 395
7/3/12	1890	1155	3120	1203	3220	1394	373, 386, 391, 395
8/7/12	1628	1123	2210	1206	2220	1128	373, 386, 392, 395
9/5/12	1220	643	1826	1012	1654	878	373, 387, 392, 396
10/2/12	1616	924	2140	1223	1958	1114	373, 387, 392, 396
11/13/12	1676	963	2410	1437	2160	1255	374, 388, 393, 396
12/10/12	1054	521	1682	914	1239	705	374, 388, 393, 396
1/10/13	1598	875	2320	1385	1964	1143	415, 419, 421, 423
2/7/13	1283	668	3030	1221	1691	900	415, 419, 421, 423
3/6/13	1691	982	3010	1298	1947	1107	416, 419, 422, 423
4/1/13	1316	680	3310	1208	1688	923	416, 419, 422, 423
5/14/13	1620		2380		1790	1150	1299-1300
6/10/13	1500		1920		1610	1000	1310-11
7/3/13	1550		1940		1760	1060	1056-57
8/1/13	1350		1730		1500	1030	1289-90
9/3/13	1300		1540		1360	1030	1644-45

34. Fola's consultant, EnviroScience, Inc., performed a biological survey in April-May 2012 that measured WVSCI, RBP, water chemistry, channel morphology and fish at the

following four sites at the Fola 4A site (see map in paragraph 22 above for locations of these points) (2012 EnviroScience WQS Report, DOC36, at FOLA#4A000102):

Site	Date	Stream	Description
BASD3RLW	5/8/12	Rt. Fork of Leatherwood Creek	Approx. 325 meters downstream of Outlet 022. Also downstream of Outlets 024, 009, & 023
BASURLW	4/25/12	Rt. Fork of Leatherwood Creek	Upstream of the confluence with Cannel Coal Hollow
BASDCH27	5/8/12	Trib. in Cannel Coal Hollow	Approx. 824 meters upstream of the confluence with Rt. Fork Leatherwood Creek
BASD1RLW	5/7/12	Rt. Fork of Leatherwood Creek	Downstream of Cannel Coal Hollow

35. The sampling by EnviroScience produced these WVSCI and RBP scores and fish counts at these sites on the dates listed in paragraph 38 above (2012 EnviroScience WQS Report, DOC36, at FOLA#4A000111-12, 118, 1023, 1046-47, 1710-11, 1775):

	BASD3RLW	BASURLW	BASDCH27	BASD1RLW
% 2 Dominant Taxa	87.4	96.7	73.2	76.0
% Chironomidae	34.5	95.5	42.9	60.0
% EPT	2.3	1.1	11.6	8.0
HBI	5.98	6.00	5.12	5.8
# EPT Taxa	1	1	3	1
# Total Taxa	5	6	14	7
WVSCI	29.0	16.7	44.4	30.7
# of fish species	2	5	0	3
# of individual fish	170	41	0	61
RBP (April-May 2012)	157	139	137	141
RBP (April-May 2013)	115	133	124	133

36. The chemistry results at these sites on the dates listed in paragraph 38 above were (2012 EnviroScience WQS Report, DOC36, at FOLA#4A000117):

	BASD3RLW	BASURLW	BASDCH27	BASD1RLW
Calcium	265	<0.2	220	202
Magnesium	211	199	151	156
Potassium	16.2	20.2	13.6	14
Sodium	30.3	57	20.1	31.3
Alkalinity	124	98	38	93

Sulfate	1150	1310	954	942
TDS	1830	2060	1560	1450
pH	8.38	8.26	7.71	8.17
Conductivity	1689	1720	1357	1538

37. A comparison of the EPT taxa and abundance data from the 2001 Potesta report and the 2012 EnviroScience report shows the following (DOC33 at FOLA#4A001883-84, 1890, 1925, 1930-33, 1988-89, 2022-27; DOC36 at FOLA#4A000111-112, 135-136, 160):

ORDER	FAMILY	GENUS/SPECIES	FOLA-6 (m/d/yr)				FOLA-7 (m/d/yr)				BASD1RLW	
			11 18 99	3 8 00	11 16 00	3 28 01	11 18 99	3 8 00	11 16 00	3 27 01	Kick 5 7 12	Multi 5 7 12
Ephemeroptera	Baelidae	Baetis		1				7		1		
	Ephemerelidae	Eurylophella	8									
		Drunella				3						
		Serratella						3		1		
	Heptageniidae	Stenonema				1			1	2		
		Epeorus						3				
	Isonychidae	Isonychia			1	1						
Plecoptera	Capniidae						48					
		Allocapnia			10				40			
	Leutridae	Leuctra	8	5			88					
	(early instar)											2
	Nemouridae	Amphinemura		1				8		15		1
	Perlidae						176					
		Acroneuria				1				4		
		Paraggnetina	32									
	Perlodidae	Isoperla		4				20	4	4		
	Taenioplerygidae	Taeniopteryx	456	2	20		792		11	2		
		Oemopteryx		131				46				
Trichoptera	Hydroptilidae	Hydroptila			2						4	1
	Hydropsychidae	Diplectrona				2	4			2		
		Chematopsyche	48	22		1	20	14	4	3		
		Potamyia		9				2				
		Ceratopsyche			10							
		Hydropsyche				1		9				2
	Limnephilidae	Hydatophylax		1								
	Philopotamiidae	Chimarra				1		1	9	6		
		Dolophilodes			3	1						

		Wormaldia						1				
	Polycentropodida	Polycentropus								1		
	Uenonidae	Neophylax		2						2		
	Rhyacophiideae	Rhyacophilia						1				
	Lepidostomatidae	Lepidostoma						1				
Diptera	Ceratopogonidae						12					
		Bezia/Palpomyia										1
		Dasyhelea										5
		Forcipomyia										1
	Chironomidae		184	48	19	47	128	89	6	42		
		Tanytarsus										1
	Diamesinae	Diamesa									1	
	Empididae	Hemerodromia			8	6			16	5	8	9
		Cinocera										2
	Ephydridae	Ephydra		2								
	Orthocladiinae	Cricotopus									29	65
		Eukiefferiella										1
		Orthocladius										11
		Parametriocnemus										1
	Simuliidae	Prosimulium		1								
		Simulium								1		
	Tanypodinae	Procladius										1
	Tipulidae	Tipula	12	6		2		1		1		1
		Pseudolimnelphia				1						
		Molophilus		2				1				
		Antocha						20			1	
Coleoptera	Georyssidae	Georyssus		1								
	Elmidae		12	1			40					
		Oulimnius			2				1			
		Optioservus		32	5	2		13	25	7	2	
	Psephenidae	Ectopria		1						1		
Odonata	Aeshnidae											7
	Gomphidae	Arigomphus			2							
		Stylogomphus									1	
	Cordulegastidae	Cordulegaster		1	1							
Megaloptera	Corydalidae	Nigonia	8		1			2	1			
Acariformes	Sperchonidae	Sperchon										1
Collembola	Entomobryidae					1		1				
Decapoda	Cambaridae	Cambarus						1				
Hemiptera	Veliidae	Rhagovelia										1

Oligochaeta			16		12	12	180	1	10	6	4	3
# EPT Taxa							9			9	1	
# Total Taxa							16			19	7	
# Total Individuals							103			115	50	117
Conductivity			736	556	742	461	940	539	717	367	1740	1740
Sulfate			280	152	152	120	792	476	512	232	942	942
WVSCI						59				70	30	30
RBP					131				140		141	141

38. Monitoring data show the following levels of constituents in pre-mining samples in Right Fork at sites FOLA-6 and FOLA-7 in Spring 2001 (2001 Potesta Report, FOLA#4A001890, DOC33) and in samples taken by Fola at the two sites downstream of Outlets 022, 023 and 027 on the Right Fork of Leatherwood Creek in Spring 2012 (2012 EnviroScience WQS Report, DOC36, at FOLA#4A000117):

Location	pH	Conduct-ivity	Alkalinity (CaCO3)	Hardness (CaCO3)	Ca	Mg	Na	K	Cl	SO4
FOLA-6 (2001)	7.15	461	22	189	34	25	8	3	3	120
FOLA-7 (2002)	7.35	367	22	396	34	75	2	3	1	110
BASD3RLW	8.38	1689	124	n/a	265	211	30	16	n/a	1150
BASD1RLW	8.17	1538	93	n/a	202	156	31	14	n/a	942

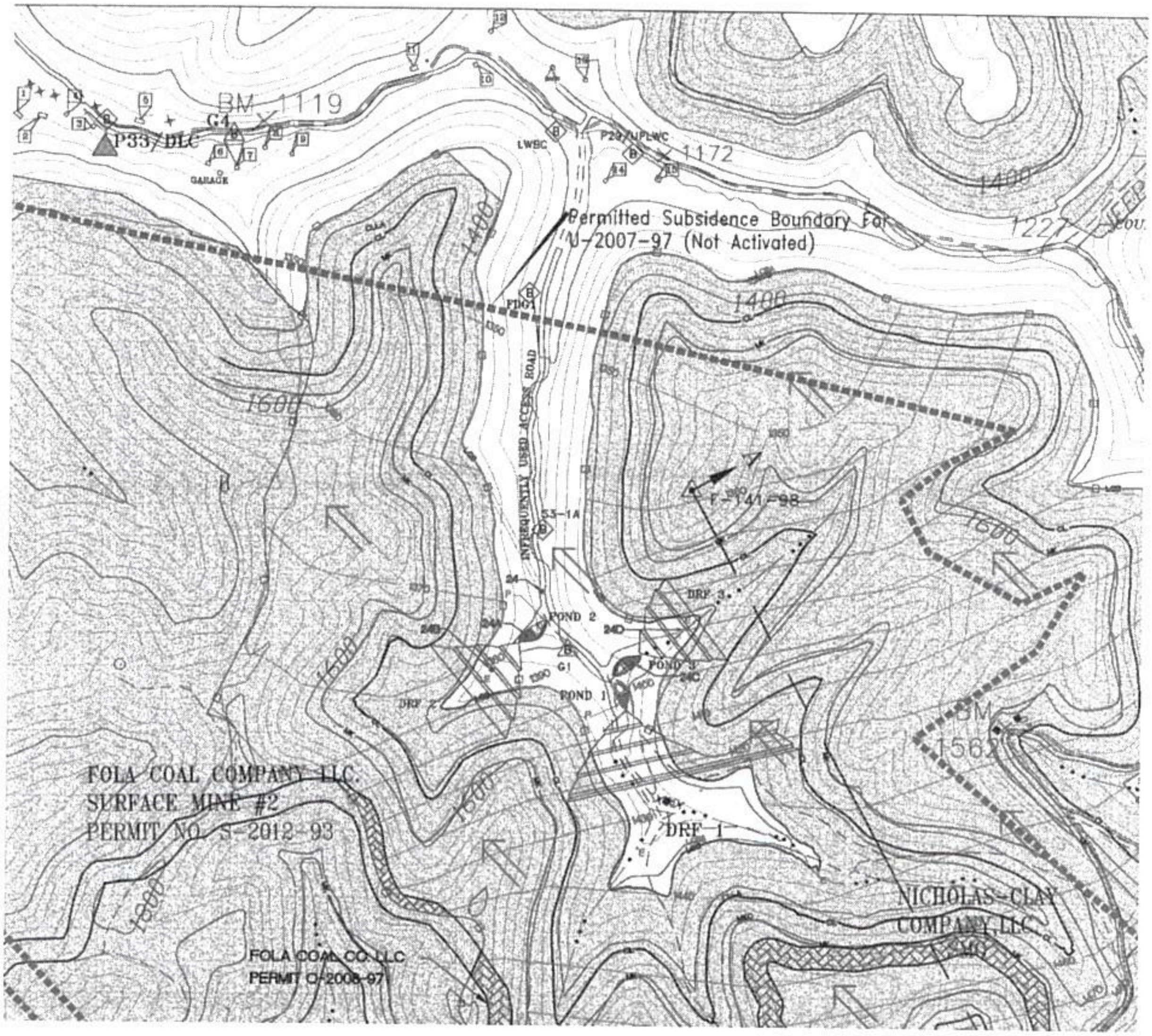
Fola Surface Mine No. 6

39. Fola owns and operates Surface Mine No. 6 in Nicholas County, West Virginia.

40. The mine area contains three valley fills (DRFs 1, 2 and 3) that partially fill Cogar Hollow. DRF 1 discharges water into Pond 1, which discharges from Outlet 015. DRF 2 discharges water into Pond 2, which discharges from Outlet 013. DRF 3 discharges water into Pond 3, which discharges from Outlet 017. Outlets 013, 015, and 017 discharge into an unnamed

tributary in Cogar Hollow that flows into Leatherwood Creek, which is a tributary of the Elk River. S201199 Drainage Map, DOC38; S201199 Flow Diagram, DOC39.

41. The following map excerpt shows the outlet locations (DOC38):



42. Fola holds West Virginia Surface Mining Permit No. S201199 and WV/NPDES Permit No. WV1018001 for its Surface Mine No. 6.

43. Fola's current WV/NPDES permit WV1018001, issued in 2008, limits discharges at Fola's Surface Mine #6 from Outlets 013, 015 and 017 into an unnamed tributary in Cogar

Hollow. WV1018001 NPDES Permit, DOC40. WVDEP has extended the term of that permit until May 17, 2015. WV1018001 Permit Extension, DOC41.

44. Fola's current West Virginia Surface Mining Permit No. S201199 was renewed in 2011 and expires on June 2, 2015. S201199 WV/SMCRA Permit, DOC42.

45. In samples taken between January and December 1999, prior to mining, Fola measured the following levels of conductivity (in µS/cm) and sulfate (in ppm) at monitoring point S3-1A (S201199 2000 Permit application, p. J-7.g.1, DOC44):

Date	Conductivity	Sulfate	Flow (cfs)
1/29/99	207		40
2/9/99	141		58
3/31/99	54		40
4/30/99	48		112.3
5/29/99	57		9
6/30/99	720	95	4.5
7/30/99	67	17	13.5
8/30/99	2	76	184
9/30/99	4	144	72
10/25/99	62	33	94.3
11/30/99	49	8	94
12/29/99	295	80	80.8

46. After mining began, Fola constructed three valley fills (DRFs 1, 2 and 3) in Cogar Hollow upstream from monitoring point S3-1A. Since that time, Fola has measured the following levels of conductivity and sulfate levels at monitoring point S3-1A (WV1018001 Art. 3 Analysis, DOC46):

Date	Conductivity	Sulfate	Flow (cfs)
1/13/2010	4610	2212	0.114
2/4/2010	4390	2275	0.089
3/4/2010	4220	2282	0.101
4/15/2010	4200	2413	0.088
5/3/2010	3670	1830	0.112
6/1/2010	4550	2528	0.124
7/8/2010	4710	3167	0.121

8/2/2010	4610	2473	0.101
9/16/2010	4710	2748	0.121
10/15/2010	4760	3459	0.114
11/4/2010	3970	2029	0.164
12/1/2010	2930	937	0.144
1/18/2011	4940	2278	0.112
2/2/2011	5130	1579	0.112
3/1/2011	3670	1600	0.144
4/5/2011	3870	1838	0.154
5/4/2011	4640	1988	0.124
6/8/2011	4300	1682	0.164
7/12/2011	4620	2473	0.121
8/8/2011	5340	2282	0.144
9/6/2011	3520	1726	0.424
10/4/2011	3540		0.201
11/10/2011	5650		0.211
12/1/2011	4430		0.268
1/11/2012	3650	2053	0.201
2/8/2012	5060	2465	0.211
3/5/2012	4270	1686	0.224
7/3/2012	5000	2464	0.211
8/7/2012	4550	2146	0.154
9/5/2012	4920	2288	0.201

47. Monitoring data from Outfalls 013, 015 and 017 since July 2012 show the following measured levels of conductivity (S201199 SM6 Outlet Data, DOC47):

Date	Outfall	Conductivity	Flow (gpm)
10/5/11	013	3780	102
10/17/11	013	4060	100
11/1/11	013	4040	90
11/11/11	013	4080	90
12/2/11	013	5020	90
12/13/11	013	3780	87
7/2/12	013	4000	60
7/12/12	013	4080	55
8/2/12	013	3880	58
8/15/12	013	4050	60
9/6/12	013	4120	60
9/24/12	013	3770	60
10/5/11	015	2520	120
10/17/11	015	2960	117

11/1/11	015	2970	118
11/11/11	015	3470	100
12/2/11	015	3330	100
12/13/11	015	2880	95
1/2/2012	015	3012	90
1/12/2012	015	2950	95
2/1/2012	015	3010	95
2/14/2012	015	3100	95
3/5/2012	015	3050	90
3/16/2012	015	2930	90
4/2/2012	015	3040	90
4/12/2012	015	3140	90
7/2/12	015	3330	80
7/12/12	015	3350	70
8/2/12	015	3050	70
8/15/12	015	3480	50
9/6/12	015	3190	50
9/24/12	015	2680	50
10/5/11	017	2880	112
10/17/11	017	3420	109
11/1/11	017	3390	106
11/11/11	017	3400	98
12/2/11	017	4380	98
12/13/11	017	3350	95
1/2/2012	017	3450	90
1/12/2012	017	3400	95
2/1/2012	017	3380	95
2/14/2012	017	3390	95
3/5/2012	017	3390	90
3/16/2012	017	3470	95
4/2/2012	017	3540	90
4/12/2012	017	3600	90
7/2/12	017	3440	80
7/12/12	017	3510	60
8/2/12	017	3170	60
8/15/12	017	3480	50
9/6/12	017	3530	50
9/24/12	017	3140	50

48. Monitoring data show the following levels of constituents sampled by Fola in July 2007 at Outlet 015 (as representative of all outlets) and reported by Fola in its 2008 WV/NPDES permit application (pp. 17-20, DOC51), and its 2012 WV/NPDES application (DOC52):

Location	pH	Conduct-ivity	Alkalinity (CaCO3)	Hardness (CaCO3)	Ca	Mg	Na	K	Cl	SO4
Mine No. 6 Outlets (July 2007)	6.03	3420	66	2263	486	254	9	n/a	1	1912
Mine No. 6 Outlet 013 (6/5/12)	7.52	n/a	93	2896	n/a	448	n/a	n/a	8.93	2786
Mine No. 6 Outlet 015 (6/5/12)	7.09	n/a	123	2281	n/a	n/a	n/a	n/a	7.98	2018
Mine No. 6 Outlet 017 (6/5/12)	6.53	n/a	59	1878	n/a	284	n/a	n/a	10.24	2133

ATTACHMENT B

Doc. No.	Fola Mine No.	Permit	Date	Description	Image File #	Page
1	2	WV1013840	8/13/07	Permit Application	00000056	87-103
2	2	WV1013840	8/13/07	NPDES Reissuance/ GPP Map (excerpt)		FOLA2and6-000101
3	2	WV1013840	9/13/13	Site Location Map		FOLA2and6-000191
4	2	WV1013840	1/17/2014	WV/NPDES Permit		
5	2	S201293	9/3/10	WV/SMCRA Permit	00000371	2
7	2	S201293	2/17/94	Permit Application	00000154	469-470, 490
9	2	WV1013840	2010-2012	Art. 3 Analysis		
10	2	WV1013840	1/4/00	Permit Application	00000041	144-207
11	2	WV1013840	3/28/03	Permit Application	00000045	198-215
12	2	WV1013840	2011-2012	Outlet 001 analysis		FOLA2and6-002556-002557
13	2	WV1013840	2011-2012	Art 3 Analysis		
17	2	WV1013840	3/30/12	REIC report		FOLA2and6-000102-000131
18	2	WV1013840	9/13/13	EnviroScience report		FOLA2and6-000132-000187
19	2	WV1013840	9/13/13	EnviroScience report		FOLA2and6-000188-000247
20	2		8/17/11	REIC Report, Appendix E		FOLA2and6-000077-78, 000092
21	4A	S200502	5/8/03	CHIA	00000069	58-89
22	4A	WV1013815	7/22/03	Stream Delineation Map		FOLA#4A002551
23	4A	WV1013815	7/15/05	Drainage Map	00000067	
24	4A	S200502	1/28/03	Flow Diagram	00000022	
25	4A	WV1013815		Site Location Map		FOLA#4A000841
26	4A	WV1013815	1/17/14	NPDES Permit		
27	4A	S200502	2/11/14	WV/SMCRA Permit		
28	4A	WV1013815	7/22/03	NWP 21 Authorization		FOLA#4A002119-2122
29	4A	S200502	2/26/02	AOC Process	00000068	FOLA#4A002234-

				Report		2236
30	4A	S200502	Jan 2003	Project Purpose Statement		FOLA#4A002561-2563
31	4A	S200502	1/24/03	Permit application	00000082	25.181, 25.191-25.193
32	4A	WV1013815		Biological survey		FOLA#4A001826-1828
33	4A	S200502	7/12/01	Potesta Report		FOLA#4A001868-91, 1930-33, 1925, 1988-89, 2020-27
34	4A	S200502	2008-2013	Art. 3 Analysis		FOLA#4A000169, 303-04, 307-08, 315-17, 352-71, 409-15
35	4A	S200502	2008-2013	Art. 3 Analysis		FOLA#4A000170-72, 177-78, 180-86, 211-15, 226-36, 266-69, 280-88, 317-19, 331-39, 371-74, 384-96, 415-16, 419-23, 1299-1300, 1310-11, 1056-57, 1289-90, 1644-45
36	4A	WV1013815	11/26/12	EnviroScience Report		FOLA#4A000098-161
38	6	S201199	4/24/00	Drainage map	00000043	
39	6	S201199	1/19/00	Flow diagram	00000042	
40	6	WV1018001	2/18/08	NPDES permit	00000005	4-54
41	6	WV1018001	6/16/14	NPDES permit extension		
42	6	S201199	1/24/11	WV/SMCRA permit	00000328	2
44	6	S201199	2/15/00	Permit Application	00000100	57 (J.7.g.1)
45	6	S201199	3/10/00	Potesta Report	00000100	460-89 (K-40 to K-69)
46	6	WV1018001	2010-2012	Art. 3 Analysis		
47	6	S201199	2011-2012	SM6 Outlet Data		FOLA2and6-002570-002581
48	2	WV1013840	8/15/14	EnviroScience report		FOLA2and6-000188-000247
49	4	WV1013815	8/21/13	EnviroScience Report		FOLA#4A-
51	6	WV1018001	9/19/07	NPDES Permit Application		

52	6	WV1018001	10/--/12	NPDES Permit Application		WV1018001 Oct. 1012 Renewal App.pdf

Declaration of Margaret A. Palmer

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Report on Fola's Nos. 2, 4A, and 6 Surface Mines in the Leatherwood Creek Watershed in Clay and Nicholas Counties, W.V.

By: Margaret A. Palmer,
Professor and Director
National Socio-Environmental Synthesis Center
University of Maryland

September 23, 2014

Qualifications to provide expert comments: I am a Professor at the University of Maryland and Director of the National Socio-Environmental Synthesis Center where I oversee an international research center as well as a scientific research laboratory. I have over 30 years of experience in research and teaching on aquatic ecosystems and have extensive knowledge about stream ecosystem science and restoration ecology. I was the lead research scientist on a project that synthesized the status of stream and river restoration in the U.S. I have published a book on The Foundations of Restoration Ecology and currently have extramurally funded research programs helping in the design and assessment of stream restoration. I serve on numerous national and international panels dealing with stream and watershed science. With respect to the topic of this report, I have published peer-reviewed papers related to mining in the Appalachian mountain region. My resume is attached.

Contents

Background on Leatherwood

Fola owns and operates three surface coal mines along three tributaries of Leatherwood Creek in Clay and Nicholas Counties, West Virginia. The mines are in the Appalachian Plateau physiographic province. The Leatherwood Creek watershed is 10,321 acres in size and the three mines impact three tributaries to the Leatherwood Creek. In order from downstream to upstream, the mines are: Fola Surface Mine No. 4A in the Right Fork subwatershed, Fola Surface Mine No. 2 in the Road Fork subwatershed, and Fola Surface Mine No. 6 in the Cogar Hollow subwatershed.

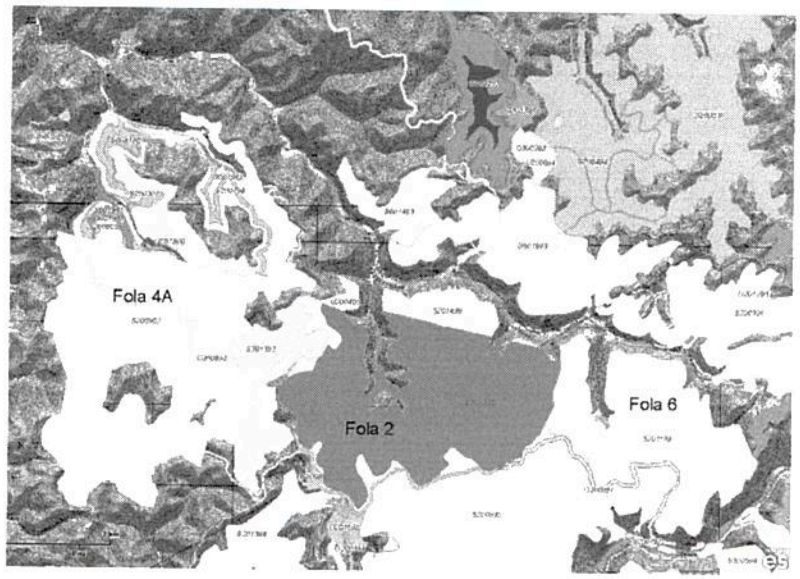


Figure 1: Topographic map of Fola Surface Mines 4A, 2 and 6 and Leatherwood Creek. (from: WVDEP http://tagis.dep.wv.gov/mining/). Leatherwood Creek flows from the lower right corner to the upper left corner.

Fola 4A mine covers 1743 acres (17% of Leatherwood Creek watershed) and monitoring point P-12 on Leatherwood Creek is below the confluence of that Creek with the Right Fork tributary (S200502 CHIA, p. 6). Prior to construction of Fola's Surface Mine No. 6, 3,556 out of a total of 10,321 acres, or 34%, of the Leatherwood Creek watershed above monitoring point P-12 was disturbed by mining. S201199 CHIA, p. 5. The approval of Fola's No. 6 mine added 896 acres of disturbance and thereby increased the cumulative disturbance to 43%. Id. In its 2012 TMDL report (p. 36), WVDEP stated that "[t]he headwater segments of Leatherwood Creek and tributaries Road Fork and Right Fork are highly dominated by mining activity, with permit bonded area encompassing 81-100 % of the total areas of sub-watersheds 20434–20438." Right Fork, Road Fork, and Cogar Hollow are in sub-watersheds 20436, 20435 and 20433, respectively. Leatherwood Creek flows into the Elk River.

In its June 6, 2012 U.S. EPA-approved report, WVDEP listed Leatherwood Creek as biologically impaired (WVDEP, Total Maximum Daily Loads for Selected Streams in the Elk River Watershed, West Virginia, p. 14). WVDEP stated that for these waters, it "determined ionic toxicity to be a significant stressor," and "a strong presence of sulfates and other dissolved solids exists in those waters and in all other streams where ionic toxicityhas been determined to be a significant biological stressor" (page 24). A full description of each of the three mines follows.

Fola Surface Mine No. 2/Road Fork

Location of mine

Fola has a surface mining (WV S201293) and NPDES permit (WV1013840) for Surface Mine No. 2. This mine is located to the south of Leatherwood Creek with Road Fork flowing from the bottom to the top in the center of the map into Leatherwood Creek (Figure 2). The mine area contains three valley fills (VFB, VFC, and VFD) that partially fill the Road Fork watershed (Figure 3). Fola's mine is the only development activity in the Road Fork Watershed.

The NPDES permit limits discharges from "the only major drainage feeding Leatherwood Creek from this permit that flows into Road Fork and Leatherwood Creek . . . " (WV1013840 2007 Permit Application, p. 14); the downstream monitoring point is S-3/DNRF in Road Fork (WV1013840 2007 Permit Application, p. 8, Flow Diagram).

Outlet 001 – from Pond #1, gets drainage from all three fills and flows to Road Fork.

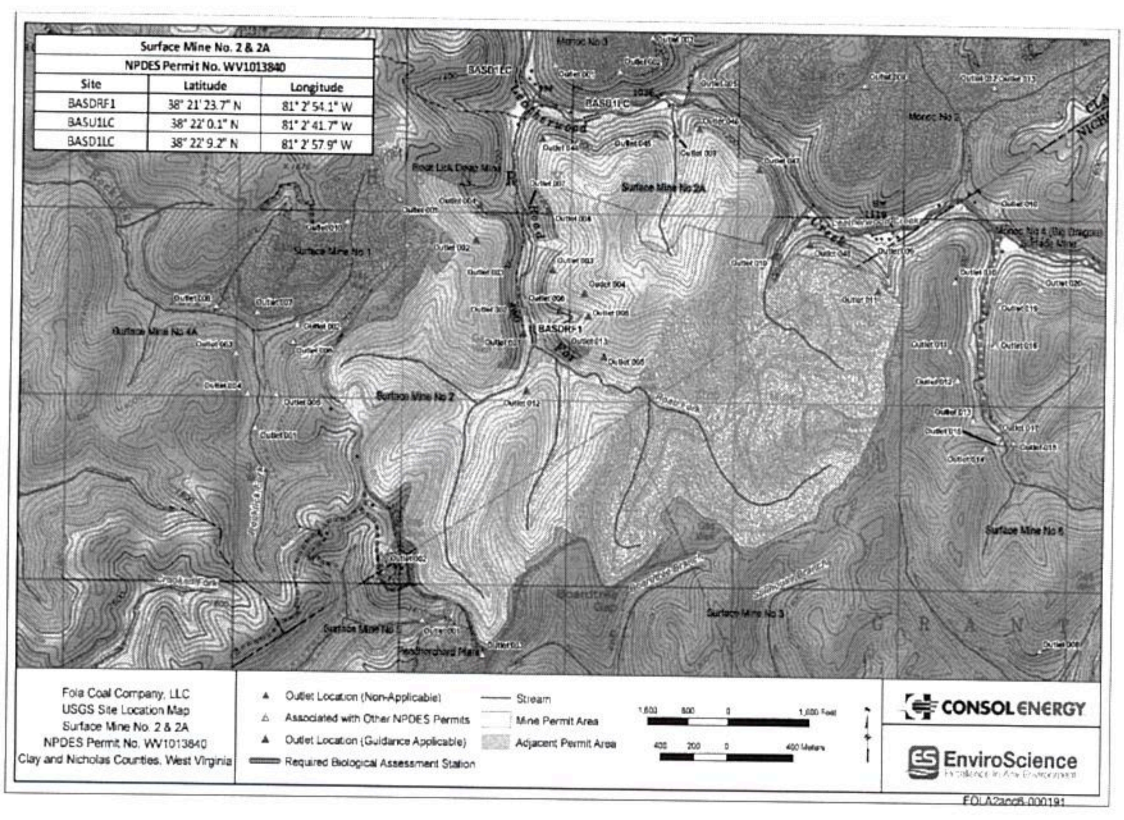


Figure 2: Fola Surface Mine No. 2 Site Location Map. (2013 EnviroScience Report, p. 4, FOLA2and6-000191).

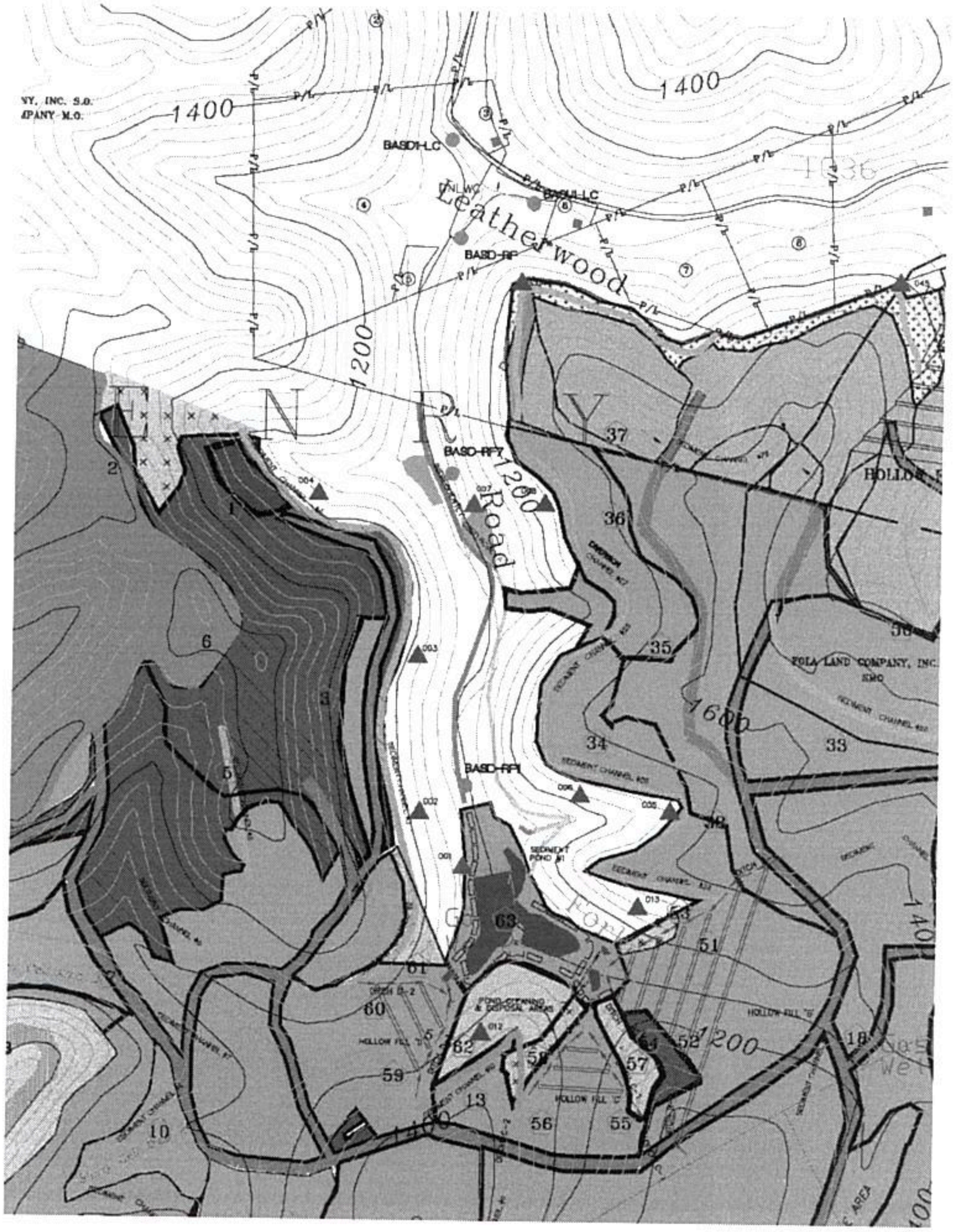


Figure 3: Fola Surface Mine No. 2 with valley fills D, C, and B (in parallel double lines) from left to right at the bottom of the map. Outlet 001 is at the red triangle at the upper left corner of the blue upside-down-Y-shaped pond below the three valley fills. Location of the Valley fills are VFB to the east, VFC to the south, and VFD to the west at the upstream limit of the remaining unfilled portion of Road Fork. (WV1013840 NPDES Reissuance/GPP map, FOLA2and6-000101)

Water quality impacts

There is extensive evidence that the Surface Mine No. 2 has caused elevated levels of chemical constituents that have led to water quality problems in Road Fork. From 1992-93, prior to mining in the watershed, the conductivity and sulfate concentrations in the stream were very low and within the range of unimpacted reference sites for West Virginia. WVDEP stated in its 1994 Cumulative Hydrologic Impact Assessment (pages 3-4) that:

"Road Fork does not appear heavily impacted by extensive past mining which has occurred in this area" and that "[t]his is indicated by low metals and sulfates that are less than 30 mg/l" (1994 CHIA, pages 3-4).

In its mining permit application, Fola reported the following baseline water quality measurements at monitoring point S-3/DNRF in lower Road Fork (Figure 4 (a),(c), (e)).

Since 1993, conductivity and sulfate concentrations measured at S-3/DNRF in lower Road Fork have increased greatly, as shown in Figure 4 (b),(d), (f) below (data in Appendix C Tables 12 and 13).

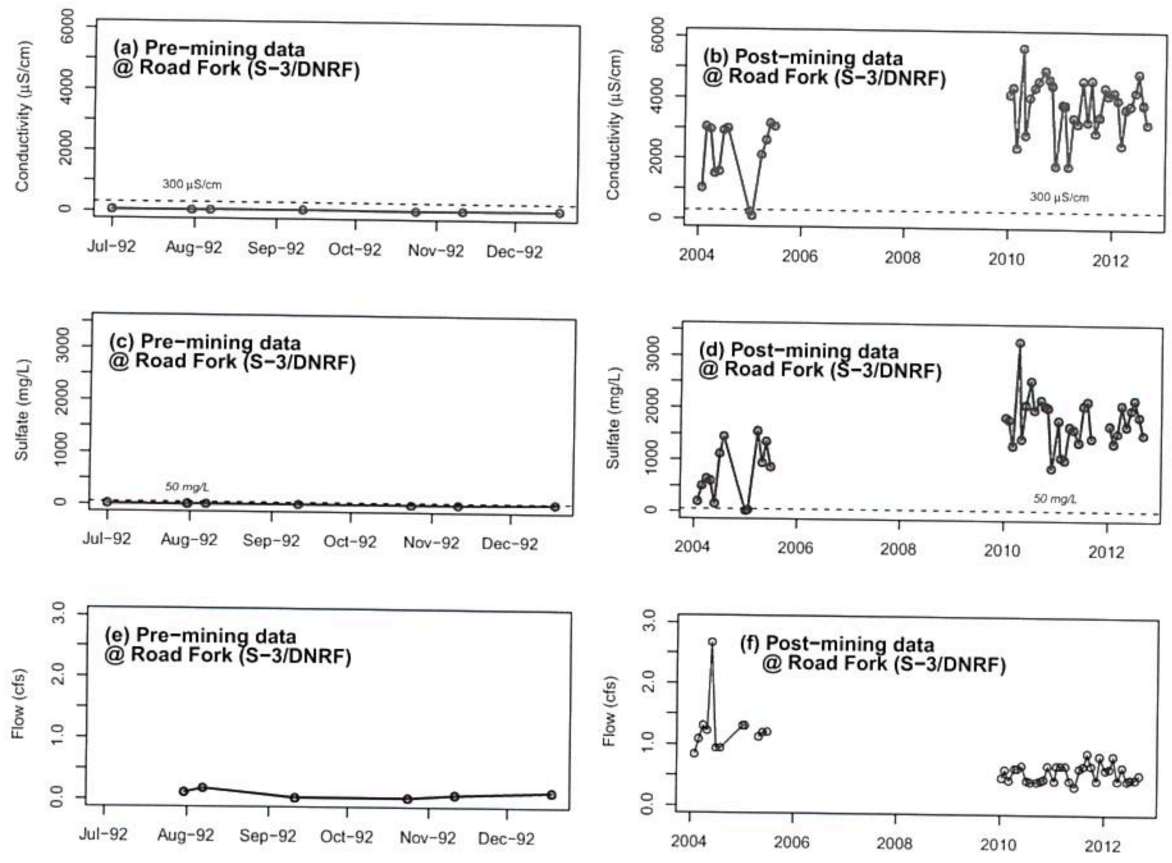


Figure 4: Baseline and post-mining conductivity levels in lower Road Fork. Left panel Data from: S201293 1994 Permit Application, Baseline Surface Water Monitoring Data, p. 656. Right panel Source for 2004-05 Data: Little Eagle Coal Co., Rocklick Coalburg Deep Mine, U200405 2006 Permit Application; Source for 2010-12 Data: Fola, WV1013840 Article 3 analysis

The EPA benchmark for conductivity is 300 µS/cm (EPA 2011; Cormier et al. 2013a). The conductivity values listed above are mostly over ten times that level. The West Virginia DEP and others have identified sulfate concentrations of 50 mg/L as indicative of mining activity in this region. Since March 2005, SO_4 concentrations in Road Fork have been extremely high ranging from 865 mg/L to over 2000 mg/L.

Source of impacts

The only land use in the Road Fork watershed is coal mining. The three valley fills at Fola's Surface Mine No. 2 drain into a pond that discharges through Outlet 001 into Road Fork. In a November 2006 sample from this outlet after mining began, Fola measured levels of chemicals which have the ionic signature that is characteristic of alkaline mine drainage associated with streams affected by mountaintop mining and valley fills in Central Appalachia (2007 Permit Appl. for WV1013840, page 18). This is shown in Table 1 that compares the chemicals in the Outlet 001 samples taken by Fola in November 2006, in BASD-RF1 samples taken by Fola in Road Fork 250 feet downstream from Outlet 001 in May 2011 (FOLA2and6-000022, 000024, 000092, 000125), 2012 and 2013 (FOLA2and 6-000184, 000204), May 2014 (FOLA2and6-002648) and by Evan Hansen in September 2014 with samples taken at Boardtree Branch by Kunz (2013):

Table 1: Chemical Composition of Alkaline Mine Drainage

Location	pH	Conductivity	Alkalinity ($CaCO_3$)	Hardness ($CaCO_3$)	Ca	Mg	Na	K	Cl	SO_4
Road Fork Outlet 001 (11/06)	8.28	3290	143	2175	358	310	12	n/a	2	419
Road Fork BASD-RF1 (5/24/11)	7.8	3200	125	2540	385	382	11.9	10.7	18.5	1860
Road Fork BASD-RF1 (5/21/12)	7.98	2700	139	n/a	370	356	11.8	22.2	n/a	1860
Road Fork BASD-RF1 (5/20/13)	8.1	2530	127	n/a	330	320	12.7	19.1	n/a	1970
Boardtree Branch	8	2367	72	1408	241	260	12	21	11	1580
Road Fork Outlet 001 (Hansen 9/9/14)	7.18	3370	160		290	300	10	17	ND	2100
Road Fork BASD-RF1 (5/19/14)	7.93	2710	145	n/a	320	292	10.6	17.7	n/a	1620

Kunz et al. (2013) showed that chemical signatures found in Boardtree Branch, which can be compared to Road Fork (note pH, conductivity, SO_4 and Ca are all comparable), display the "ionic signature representative of alkaline mine drainage associated with streams affected by mountaintop removal and valley fill with elevated Mg, Ca, K, HCO_3, and SO_4)" (Kunz et al. 2013, page 2827).

Using reconstituted water that closely matched Boardtree waters, except with lower levels of bicarbonate, Kunz found that: "Boardtree reconstituted waters were toxic to C. Triangulifer [a mayfly] at a conductivity of about 800 to 1300 µS/cm . . . with elevated concentrations of Mg, Ca, Na, K, SO_4, or HCO. ... It is interesting to note that the regional 95% extirpation concentration (XC95) based on conductivity for the genus Centroptilum in the benthic community field surveys was determined [by the EPA benchmark] to be 1092 µS/cm" (Kunz et al. 2013, page 2834).

Other water chemistry data from that outlet also show very elevated levels of conductivity and sulfate, as shown in Figure 5 and Table 2 (data in Appendix C Table 14):

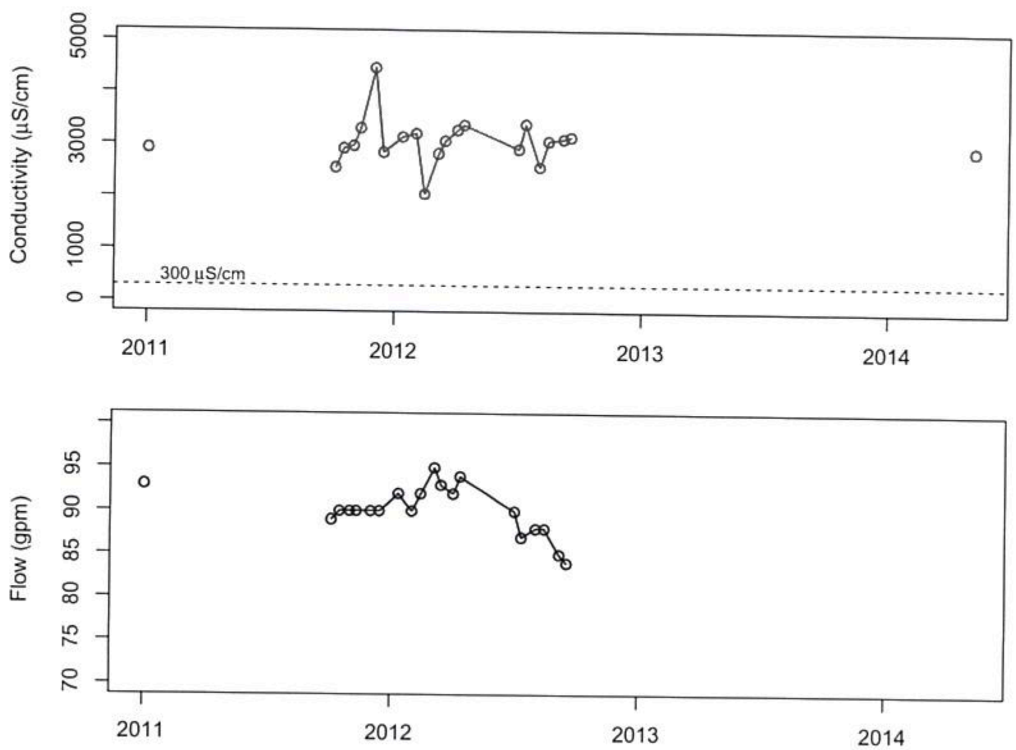


Figure 5: Water quality of Outlet 001 discharges. Source: 2000 NPDES permit app., p. 19; 2003 NPDES permit app., p. 13A; 2007 NPDES permit app., p. 15; Document No. FOLA2and6-002556-002557; WV1013840 Art. 3 Analysis.

Table 2: Additional water chemistry data from Outlet 001.

Date	Sulfate (mg/L)
1/13/1999	96
9/03/2002	1300

The outlet data collected by Fola listed in Figure 5 above demonstrate that conductivity has been very elevated in the discharge from Outlet 001.

Biological impairment

Not surprisingly given the poor water quality, the biological integrity of the stream in Road Fork is impaired. In its 2012 TMDL report, WVDEP listed Road Fork as biologically impaired and "determined ionic toxicity to be a significant stressor" (WVDEP TMDL Report, pages 14, 24).

All of the reported West Virginia Stream Condition (WVSCI) index scores since 2007 have been well below 68. In September 2007 and May 2012, WVDEP measured the WVSCI in Road Fork as 55.29 and 30.81, respectively. In May 2011, May 2012, May 2013, and May 2014, Fola's consultants, REI Consultants, Inc., and EnviroScience, Inc., conducted biological, physical, and chemical sampling in Road Fork and Leatherwood Creek and obtained the chemical sampling, RBP scores, and WVSCI scores shown in Figure 6 (data in Appendix C Table 15):

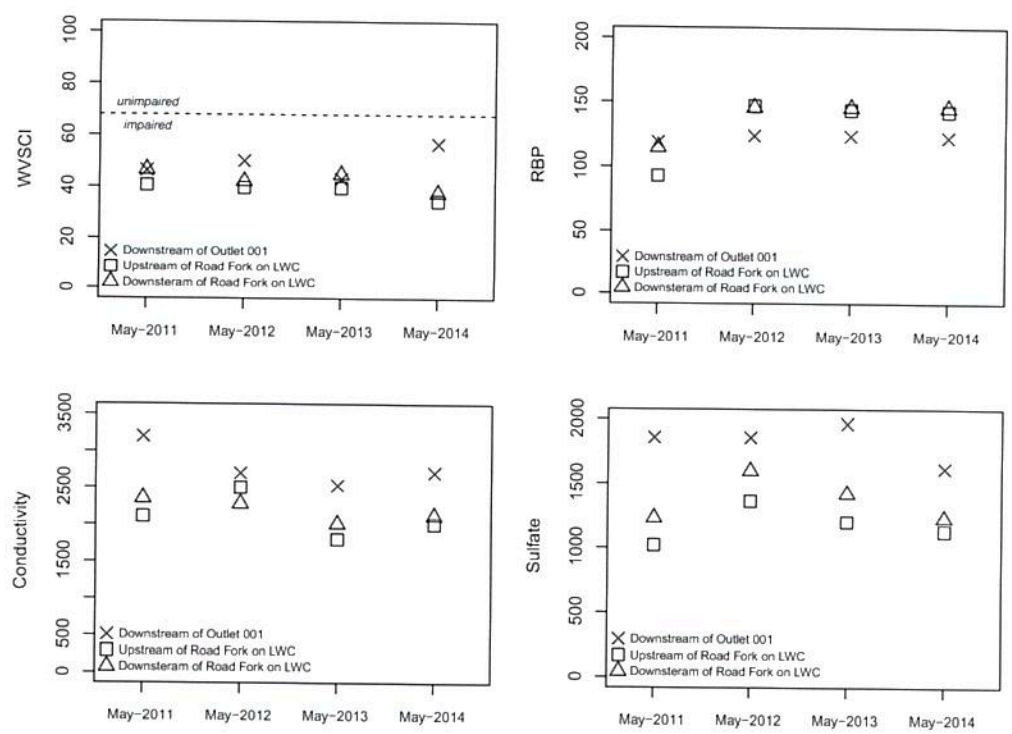


Figure 6: WVSCI, habitat quality, and water quality in Road Fork Data from 2011 REI Report, p. 25; 2012 EnviroScience Report, pp. 11-12, 15; 2013 EnviroScience Report, pp. 10, 12, 16; 2011 REI WQS Report App. E, p. 16; 2014 EnviroScience Report, pp. 11, 13.

On May 9, 2014, Dr. Christopher Swan conducted biological sampling in Road Fork below Outlet 001 and obtained a WVSCI of 40.26, a GLIMPSS of 20.22, and an RBP of 163. His results are contained in Appendix A to this report. The habitat assessments that were performed by Dr. Swan did not find a RPB habitat result sufficiently poor to cause biological impairment of the magnitude found in this stream.

The stream location downstream of Outlet 001 where EnviroScience's sampling occurred in 2012 and 2013 is depicted in the photos shown on the following pages (2013 EnviroScience Report, Appendix A, pp. FOLA2and600210 to 00211).

(a) Photograph 1: 2013 Surface Mine 2 & 2A. Site BASDRF1, upstream view.

(b) Photograph 2: 2012 Surface Mine 2 & 2A. Site BASDRF1, looking upstream

Figure 7: Photographs from Site BASDRF1

(c) Photograph 3: 2013 Surface Mine 2 & 2A. Site BASDRF1, looking downstream

(d) Photograph 4: 2012 Surface Mine 2 & 2A. Site BASDRF1, looking downstream

Figure 7: (cont'd) Photographs from Site BASDRF1

Fola Surface Mine No. 4A/Right Fork tributary

Location of mine

Fola has a surface mining (WV S200502) and NPDES permit (WV1013815) for Surface Mine No. 4A. The activities involved mining through streams and relocating existing streams. The mine covers the majority of the Right Fork watershed upstream of its confluence with Bullpen Hollow, and includes most of the watershed for two tributaries into Right Fork—Rocklick Fork and Cannel Coal Hollow. The NPDES permit limits discharges from the mine into Right Fork and Leatherwood Creek. Runoff from the mine area drains into channels:

Outlet 022 - discharges into Right Fork.

Outlet 023 - discharges into Rocklick Fork, a tributary of Right Fork.

Outlet 027 - discharges into Cannel Coal Hollow, which also flows into Right Fork.

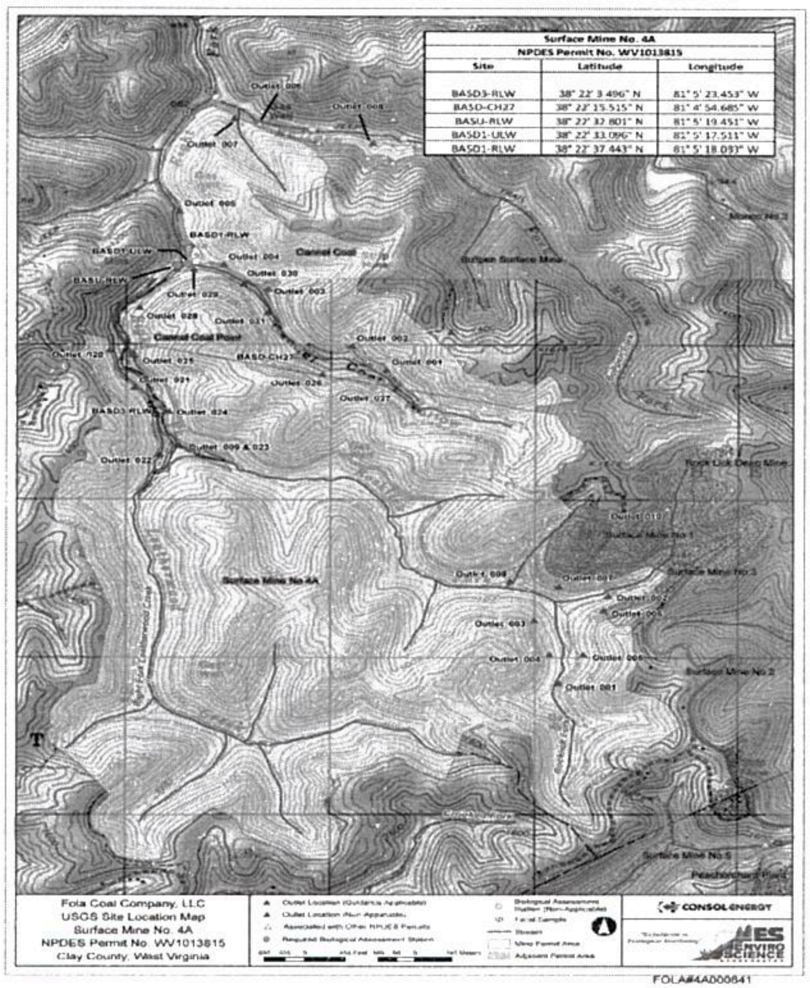


Figure 8: Fola Surface Mine No. 4A Site Location Map

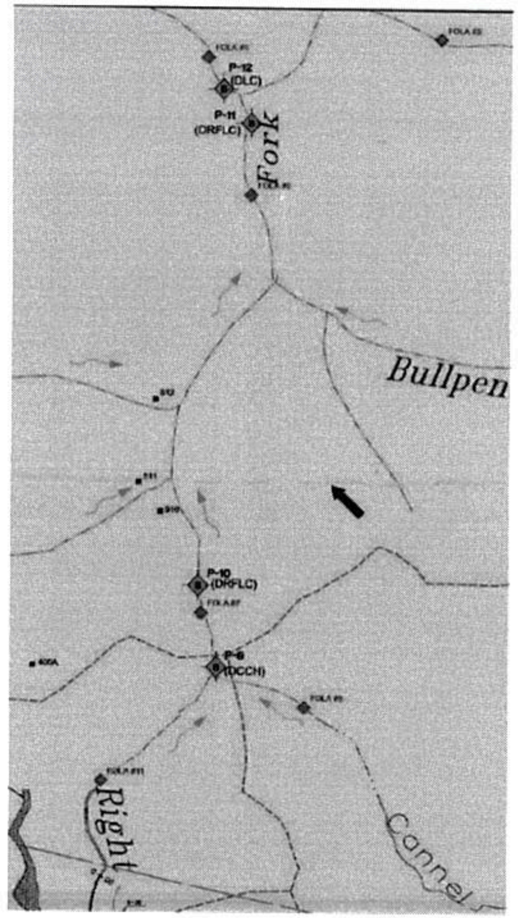


Figure 9: WV1013815 Stream Delineation Map. Sampling point P-12 is on Leatherwood Creek below its confluence with the Right Fork of Leatherwood Creek. P-11 is near the mouth of Right Fork. P-10 is on Right Fork below Cannel Coal Hollow. P-9 is near the mouth of Cannel Coal Hollow.

Water quality impacts

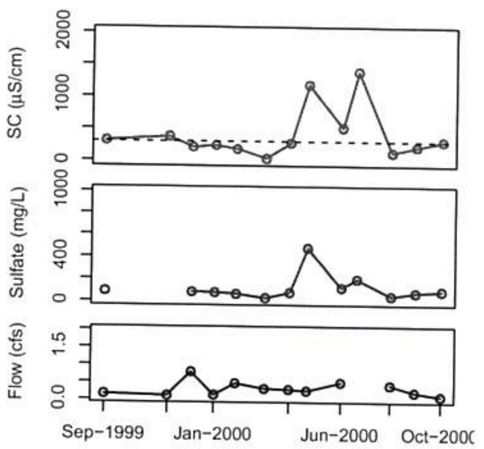
There is extensive evidence that the Surface Mine No. 4A has caused elevated levels of chemical constituents that have led to water quality problems in Right Fork. In-stream chemistry measurements have been taken at several points on and near Right Fork.

Prior to mining, WVDEP evaluated conditions in the Leatherwood Creek watershed above monitoring point P-12. WVDEP 2003 CHIA. WVDEP stated in its 2003 Cumulative Hydrologic Impact Assessment (CHIA, pp. 16-17) that:

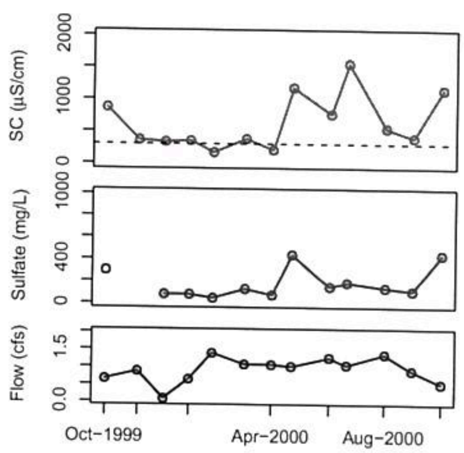
"The two sites on the upper reaches of the [Right] Fork, before it's [sic] confluence with Rocklick Fork show low buffered stream with low metals and low sulfates, indicative of no previous mining impact in the watershed in it's [sic] upper reaches. The other two sites are further downstream after mined tributaries enter the stream. The analyses shows [sic] that the Manganese and sulfates are elevated from previous mining."

The CHIA also summarized results from benthic sampling showing that "habitat ranged from 117–160 ..... [a]ll the stations have high EPT indexes." CHIA, pp. 19-20.

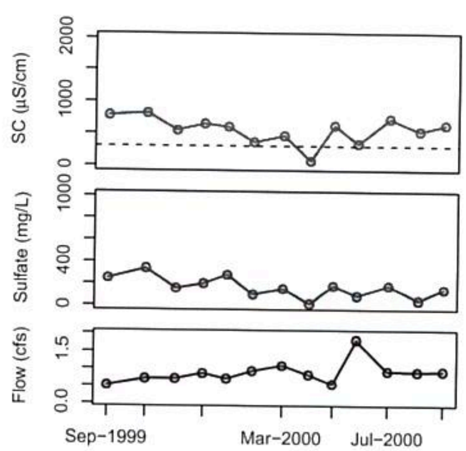
Fola measured the baseline water quality in 1999-2000 prior to beginning Surface Mine No. 4A. The sampling included points P-9 (DCCH), P-10, (DRFLC), and P-11 (DRFLC). Those points are shown on the map in Figure 9 above. The results of the sampling are shown in Figure 10 below (data in Appendix C Table 16):



(a) Pre-mining data at P-9 (DCCH)



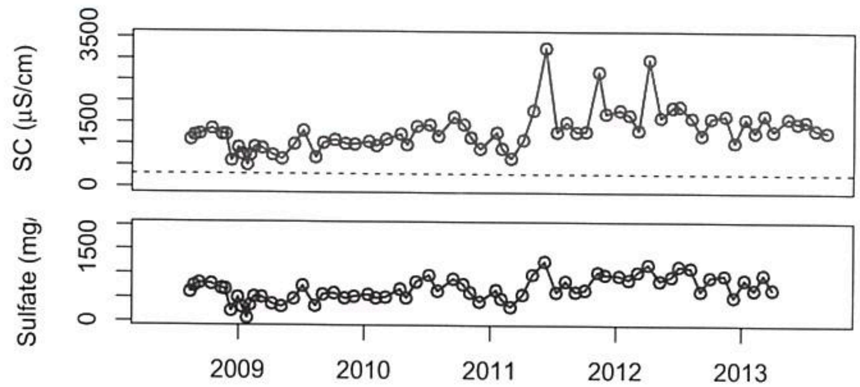
(b) Pre-mining data at P-10 (DRFLC)



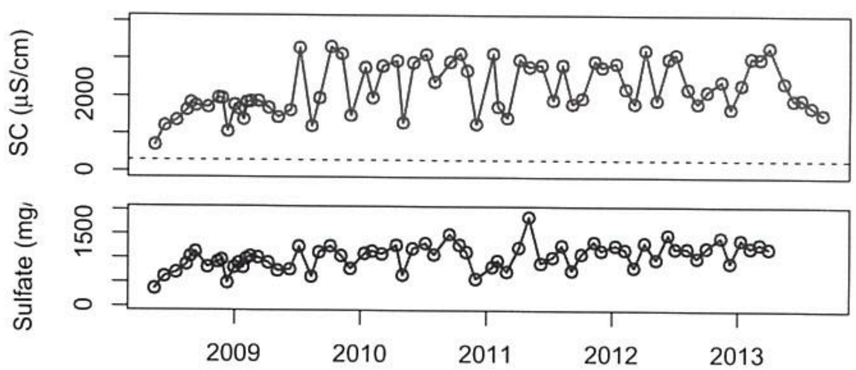
(c) Pre-mining data at P-11 (DRFLC)

Figure 10: Pre-mining water quality data in Right Fork tributary at site P-9, P-10, P-11. Measurements by Fola Mine (Source: S200502 2003 Permit Application, pp. 25.181, 25.191 to 25.193)

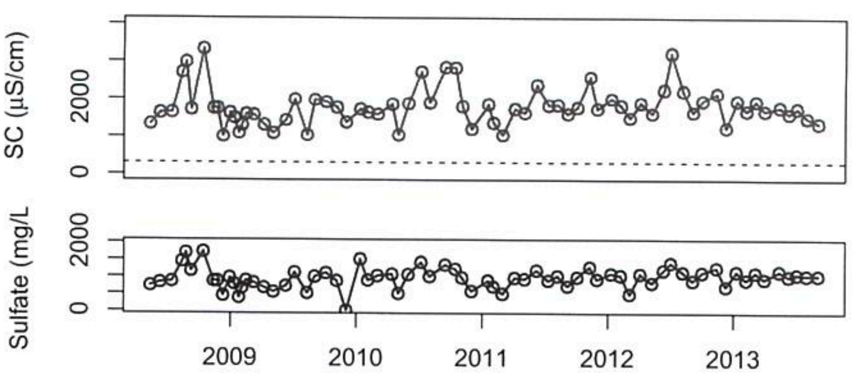
Since mining began, Fola has measured increased levels of conductivity and sulfate in Right Fork at monitoring points DCCH (P-9), DRFLC (P-10) and DRFLC (P-11). Those points are shown in the map in Figure 9 above and the monitored amounts are shown in Figure 11 below (data in Appendix C Table 17):



(a) Post-mining data at P-9 (DCCH)



(b) Post-mining data at P-10 (DRFLC)



(c) Post-mining data at P-11 (DRFLC)

Figure 11: Water quality in Right Fork tributary in 2008-2011 after mining began for Mine 4A; Measurements by Fola Mine (Source: S200502 Art. 3 Analysis, pp. FOLA4A#000177-001645)

The EPA benchmark for conductivity is 300 µS/cm (EPA 2011; Cormier et al. 2013). The conductivity values listed above are up to ten times that level. The West Virginia DEP and others have identified sulfate concentrations of 50 mg/L as indicative of mining activity in this region. Since March 2005, SO_4 concentrations in Road Fork have been extremely high ranging up to 1869 mg/L.

Source of impacts

The only land use in the Right Fork watershed is coal mining. Outlets 022 (base of Right Fork), 023 (base of Rock Lick) and 027 (headwaters of Cannel Coal) at Fola's Surface Mine No. 4A discharge into Right Fork upstream from in-stream monitoring point P-9. The water chemistry data from those outlets show very elevated levels of conductivity and sulfate, as shown in Figure 12 (data in Appendix C Table 18):

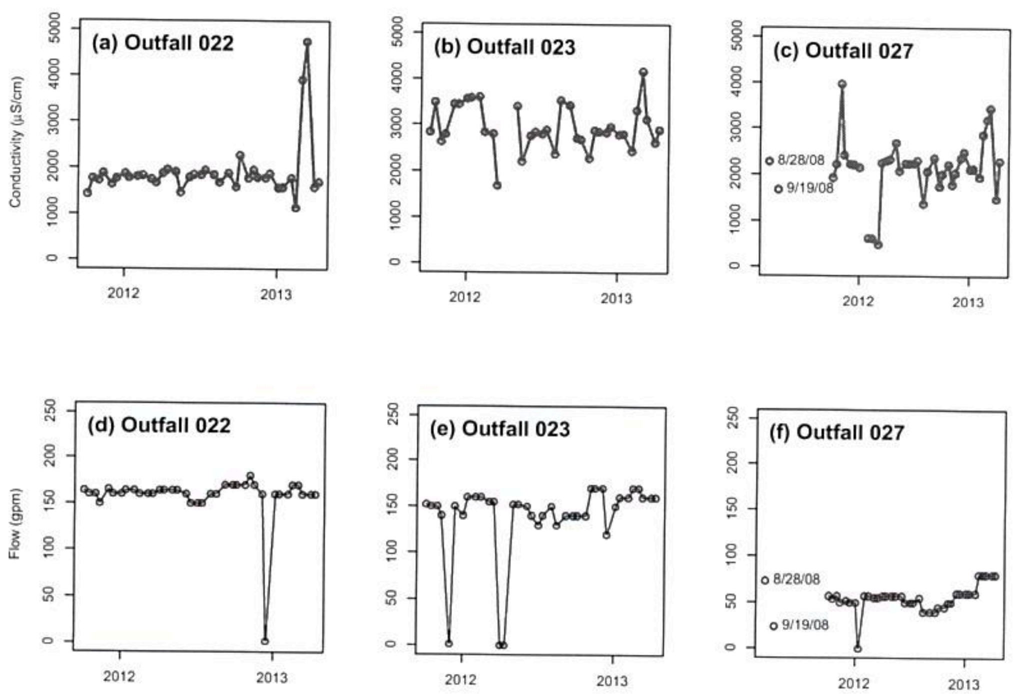


Figure 12: Conductivity of discharge from Outfalls 022, 023, and 027. Source: S200502 Art. 3 Analysis, pp. FOLA4A00169-415

The outlet and in-stream data collected by Fola and plotted above (listed in Appendices as Tables 17-18) demonstrate that conductivity levels have greatly increased since mining began, and that conductivity and sulfate levels have been very elevated in the discharges from Outlet 022, 023, and 027.

Biological impairment

Not surprisingly given the poor water quality, the biological integrity of the stream in Right Fork today is impaired. In 1997, prior to mining in Fola 4A, the WV DEP completed an assessment of the Elk River Watershed and reported that Right Fork/Leatherwood Creek had a WVSCI of 84 and an RBP of 197 (WVDEP 1997 report, Elk River Watershed Assessment, page 68). From Fall 1999 to Spring 2001, also prior to mining in Fola 4A, Potesta & Associates conducted biological surveys in Right Fork tributary to Leatherwook Creek at the following sampling points (WV1013815 Biological Survey, at p. FOLA#4A001826; S200502 2001 Potesta Report, pp. 2-3):

- FOLA-4 Leatherwood Creek- downstream (DS) Mouth of the Right Fork of Leatherwood
- FOLA-5 Leatherwood Creek- upstream (US) of the confluence with the Right Fork of Leatherwood
- FOLA-6 Right Fork of Leatherwood Creek- mouth
- FOLA-7 Right Fork of Leatherwood Creek- DS Cannel Coal unnamed tributary (UNT)
- FOLA-8 Cannel Coal Hollow Mouth (UNT) - Mouth
- FOLA-9 Cannel Coal Hollow (UNT)
- FOLA-10 Cannel Coal Hollow (UNT) - Headwaters
- FOLA-11 Right Fork of Leatherwood Creek- US Cannel Coal UNT
- FOLA-12 Right Fork of Leatherwood Creek- Above confluence with Rocklick
- FOLA-13 Right Fork of Leatherwood Creek- DS FOLA-16 I US FOLA-12
- FOLA-14 Mouth of the 4m UNT of the Right Fork of Leatherwood Creek
- FOLA-15 Right Fork of Leatherwood Creek- Headwaters
- FOLA-16 Mouth of the 5tn UNT of the Right Fork of Leatherwood Creek
- FOLA-17 Rocklick- US confluence with Right Fork of Leatherwood Creek
- FOLA-18 Rocklick- Below Pond #4
- FOLA-19 Rocklick- Above the confluence of Pond #4
- FOLA-20 UNT of Rocklick- above FOLA-19 at end of road

Points Fola-4 through Fola-20 were located in the Right Fork of Leatherwood Creek sub-watershed and surrounding areas. Points Fola-4 through Fola-7 are shown on the map in Figure 9 above (WV1013815 Biological Survey). FOLA-6 is close to and upstream of Station P-11, and FOLA-7 is close to and upstream of Station P-10. Potesta collected water quality data including data on temperature, pH, O_2, and flow. Except for Fola-5 sites, the data indicate that the stream was not biologically impaired, conductivity was generally well below levels considered problematic for macroinvertebrates, temperature and oxygen were within ranges common in healthy WV streams as was pH (Figure 13). Rapid Bioassessment Protocol scores in Fall 2000 were generally above 130 and at some sites as high as 160 (Figure 13; data in Appendix C Table 19).

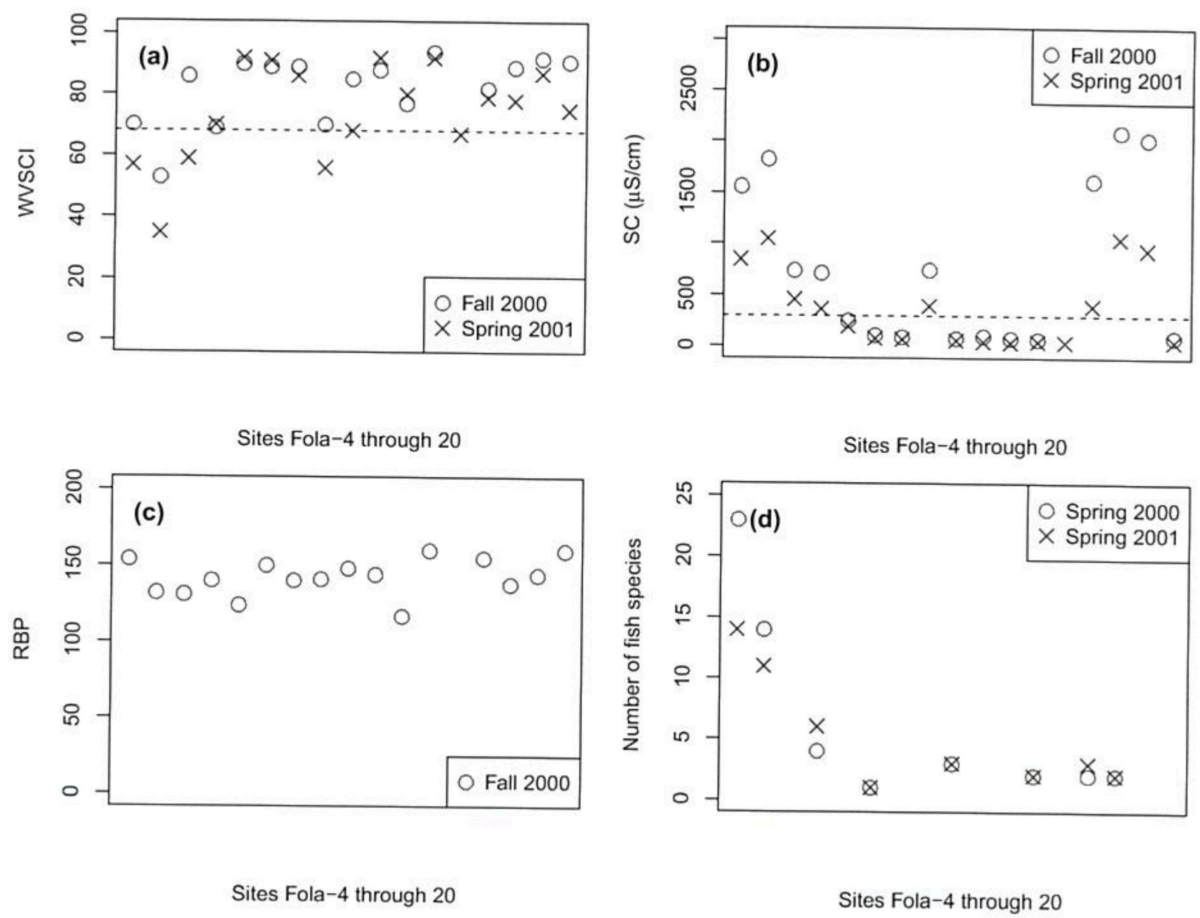


Figure 13: Biological and water quality in Right Fork Tributary pre-Fola 4a mine. Data from Potesta Report from 2000-2001. Source: WV1013815 Biological Survey, at FOLA#4A001828; S200502 2001 Potesta Report, pp. FOLA#4A001877, 1879, 1890-91, 1925, 1988-89, 2020-2027

All of the reported West Virginia Stream Condition (WVSCI) index scores since 2007 have been well below 68. In September 2007 and April 2012, WVDEP measured the WVSCI at the mouth of Right Fork as 54.02 and 19.45, respectively. In its 2012 TMDL report, WVDEP listed Right Fork as biologically impaired and "determined ionic toxicity to be a significant stressor" (WVDEP TMDL Report, pp. 14, 24).

Additional data collected in the Right Fork by Fola's consultant, EnviroScience, Inc. in 2012, confirmed that biological impairment was a serious problem (Tables 3 and 4). The WV Stream Condition Index scores were well below the 68 level impairment threshold (as low at 16.7 at one site, Figure 14). This was associated with conductivity levels well above the 300 µS/cm threshold EPA has identified; values ranged from 1357-1720 (Table 5).

Table 3: Study sites for biological, chemical, and channel surveys in April–May 2012 conducted by Fola's consultant (EnviroScience, Inc). See Figure 9 for locations.

Site	Date	Stream	Description
BASD3RLW	5/8/12	Rt. Fork of Leatherwood Creek	Approx. 325 meters downstream of Outlet 022. Also downstream of Outlets 024, 009, & 023
BASURLW	4/25/12	Rt. Fork of Leatherwood Creek	Upstream of the confluence with Cannel Coal Hollow
BASDCH27	5/8/12	Trib. in Cannel Coal Hollow	Approx. 824 meters upstream of the confluence with Rt. Fork Leatherwood Creek
BASD1RLW	5/7/12	Rt. Fork of Leatherwood Creek	Downstream of Cannel Coal Hollow
Source: 2012 EnviroScience WQS Report, at FOLA#4A000102			

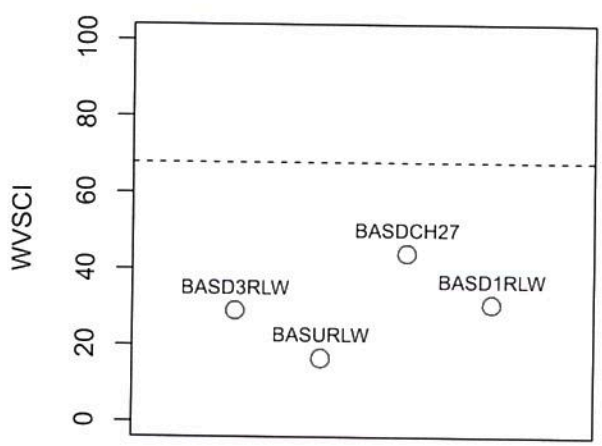


Figure 14: WVSCI in Right Fork during April–May 2012. Dotted line indicates impairment threshold. Source: 2012 EnviroScience WQS Report, at FOLA#4A000111-12, 118, 1023, 1046-47, 1710-11, 1775

Table 4: Biological indices, fish counts, and rapid biological protocol habitat assessments (RBP) for sites in the Right Fork during April – May 2012 (see location and dates in Table 3).

	BASD3RLW	BASURLW	BASDCH27	BASD1RLW
% 2 Dominant Taxa	87.4	96.7	73.2	76
% Chironomidae	34.5	95.5	42.9	60
% EPT	2.3	1.1	11.6	8
HBI	5.98	6	5.12	5.8
# EPT Taxa	1	1	3	1
# Total Taxa	5	6	14	7
WVSCI	29	16.7	44.4	30.7
# of fish species	2	5	0	3
# of individual fish	170	41	0	61
RBP (April-May 2012)	157	139	137	141
RBP (April-May 2013)	115	133	124	133
Source: 2012 EnviroScience WQS Report, at FOLA#4A000111-12, 118, 1023, 1046-47, 1710-11, 1775				

Table 5: Water chemistry results for sites in Right Fork during April – May 2012 (see location and dates in Table 10).

	BASD3RLW	BASURLW	BASDCH27	BASD1RLW
Calcium	265	<0.2	220	202
Magnesium	211	199	151	156
Potassium	16.2	20.2	13.6	14
Sodium	30.3	57	20.1	31.3
Alkalinity	124	98	38	93
Sulfate	1150	1310	954	942
TDS	1830	2060	1560	1450
pH	8.38	8.26	7.71	8.17
Conductivity	1689	1720	1357	1538
Source: 2012 EnviroScience WQS Report, at FOLA#4A000117				

EnviroScience's report concluded that "[t]he streams within the Surface Mine No. 4A were characterized as biologically impaired with regards to the benthic macroinvertebrate community. The noted impairment of these stream reaches can most likely be associated with unseasonable warm spring and chemical stressors measured throughout these sites." (2012 EnviroScience WQS Report, at FOLA#4A000121). Appendix B to this report contains a comparison of the EPT taxa and abundance data from the 2001 Potesta report and the 2012 EnviroScience report.

The chemicals reported by Fola in Table 5 above have an ionic signature that is characteristic of alkaline mine drainage associated with streams affected by mountaintop mining and valley fills in Central Appalachia. Table 6 below compares the concentrations of those chemicals at the two sites downstream of Outlets 022, 023, and 027 on the Right Fork of Leatherwood Creek in Spring 2012 and at Outlets 022, 023 and 027 as sampled by Hansen in September 2014 with the chemicals in samples taken from Boardtree Branch by Kunz (2013), and with pre-mining samples in Right Fork at sites FOLA-6 and FOLA-7 in Spring 2001 (see FOLA#4A001890):

Table 6: Chemical Composition of Alkaline Mine Drainage

Location	pH	Conductivity	Alkalinity (as $CaCO_3$)	Hardness (as $CaCO_3$)	Ca	Mg	Na	K	Cl	SO_4
FOLA-6 (2001)	7.15	461	22	189	34	25	8	3	3	120
FOLA-7 (2001)	7.35	367	22	396	34	75	2	3	1	110
BASD3RLW (2012)	8.38	1689	124	n/a	265	211	30	16	n/a	1150
BASD1RLW (2012)	8.17	1538	93	n/a	202	156	31	14	n/a	942
Outlet 022 (Hansen 2014)	7.9	1820	120		140	120	62	12	32	920
Outlet 023 (Hansen 2014)	8.1	2720	150		280	260	100	16	ND	1800
Outlet 027 (Hansen 2014)	7.12	2390	43		220	130	140	14	ND	1300
Boardtree Branch	8	2367	72	1408	241	260	12	21	11	1580

As explained above, Kunz (2013) found that Boardtree Branch had an "ionic signature representative of alkaline mine drainage associated with streams affected by mountaintop removal and valley fill with elevated Mg, Ca, K, HCO_3, and SO_4)."

On May 9, 2014, Dr. Christopher Swan conducted biological sampling in Right Fork below Outlets 022, 023, and 027 and obtained a WVSCI of 38.24, a GLIMPSS of 25.79, and an RBP of 172. His results are contained in Appendix A to this report. The habitat assessments that were performed by Dr. Swan did not find a RPB habitat result sufficiently poor to cause biological impairment of the magnitude found in this stream. WVDEP's Wadeable Benthic Stream Assessment

Forms since 2002 show the following RBP scores in Right Fork and Leatherwood Creek, which are all in the suboptimal range, as shown in Figure 15:

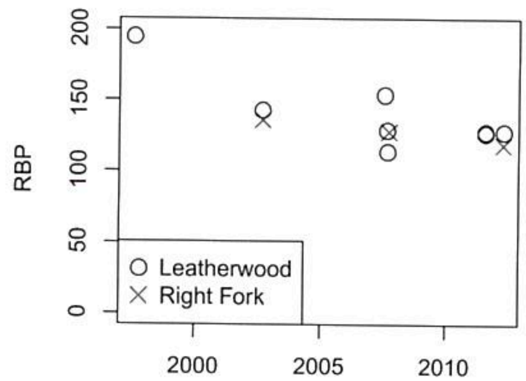


Figure 15: RBP scores in Right Fork and Leatherwood Creek. See Table 7 for data sources and specific locations

Table 7: Locations of habitat monitoring points in Right Fork and Leatherwood Creek.

Date	RBP	Cite	Location
9/6/07	114	FOLA#4A00846-47	Leatherwood Creek (KE-46- (9.9))
7/31/97	195	FOLA#4A00865-66	Leatherwood Creek (KE-46- (1.0))
9/9/02	143	FOLA#4A00876-77	Leatherwood Creek (KE-46- 5.0))
7/23/07	154	FOLA#4A00888-89	Leatherwood Creek near mouth (KE-46- (0.2))
8/9/11	128	FOLA#4A00908-09	Leatherwood Creek upstream Right Fork (KE-46-(4.7))
8/9/11	127	FOLA#4A00922-23	Leatherwood Creek upstream UNT River Mile 0.06
5/4/12	128	FOLA#4A00939-40	Leatherwood Creek upstream of Road Fork (KE-46- (8.1))
8/30/07	129	FOLA#4A00952-53	Leatherwood Creek (KE-46-(4.7))
9/9/02	136	FOLA#4A00969-70	Right Fork LWC (KE-46-C (0.0))
4/25/12	119	FOLA#4A00980-81	Right Fork LWC at mouth (KE-46-C (0.0))
9/25/07	128	FOLA#4A00996-97	Right Fork LWC (KE-46-C (0.0))

Fola Surface Mine No. 6/Cogar Hollow

Location of mine

Fola has a surface mining (WV S201199) and NPDES permit (WV1018001) for Surface Mine No. 6. The mine area contains three valley fills (DRFs 1, 2, and 3) that partially fill Cogar Hollow. The NPDES permit limits discharges from the mine into Cogar Hollow and Leatherwood Creek. Run-off from the mine through the following outlets discharges into an unnamed tributary in Cogar Hollow that flows into Leatherwood Creek (S201199 Drainage Map; S201199 Flow Diagram; Figure 16; Figure 17); the downstream monitoring point is S3-1A (Figure 16).

Outlet 015 – from Pond 1 which gets drainage from DRF 1

Outlet 013 – from Pond 2 which gets drainage from DRF2

Outlet 017 – from Pond 3 which gets drainage from DRF 3

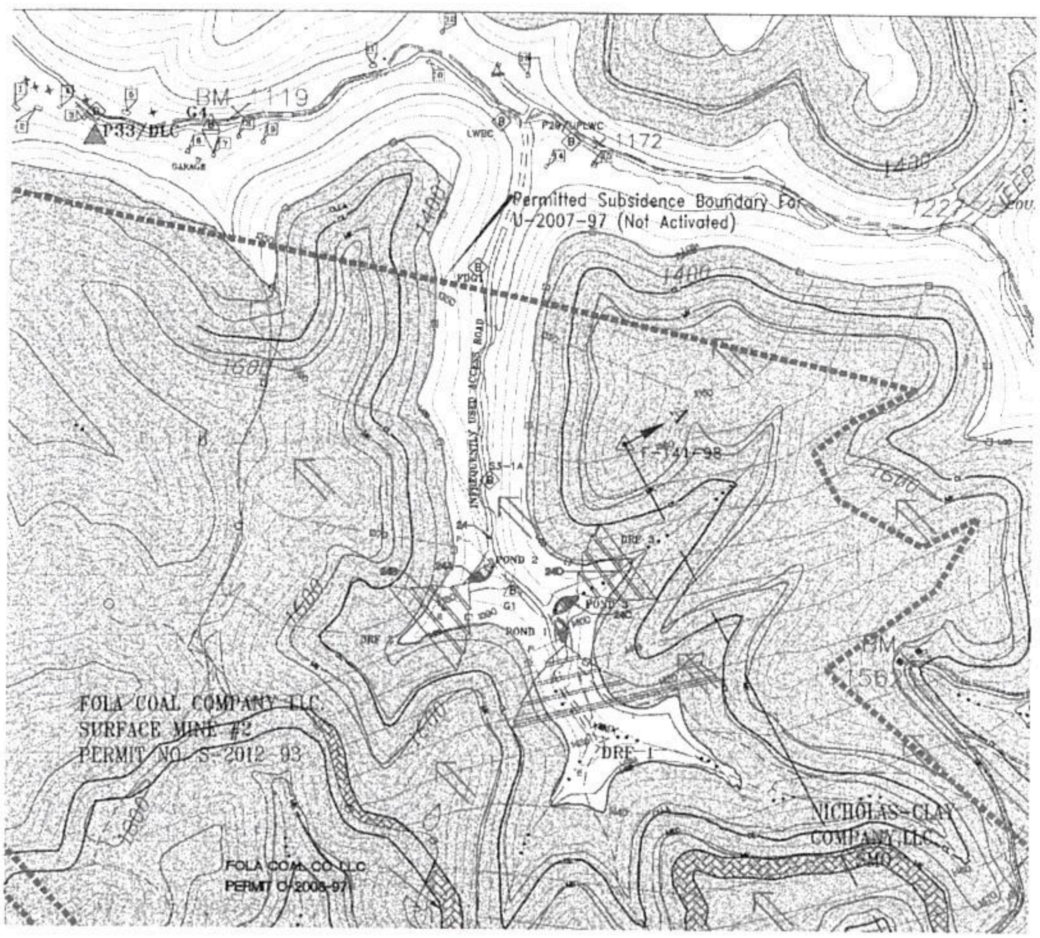


Figure 16: Location of the valley fills (DRF 1, 2, 3), ponds (1,2,3), and downstream monitoring point (S3-1A). (Source: April 24, 2000 S201199 Geohydrologic Map for Fola Surface Mine No. 6, File No. 00000043.)

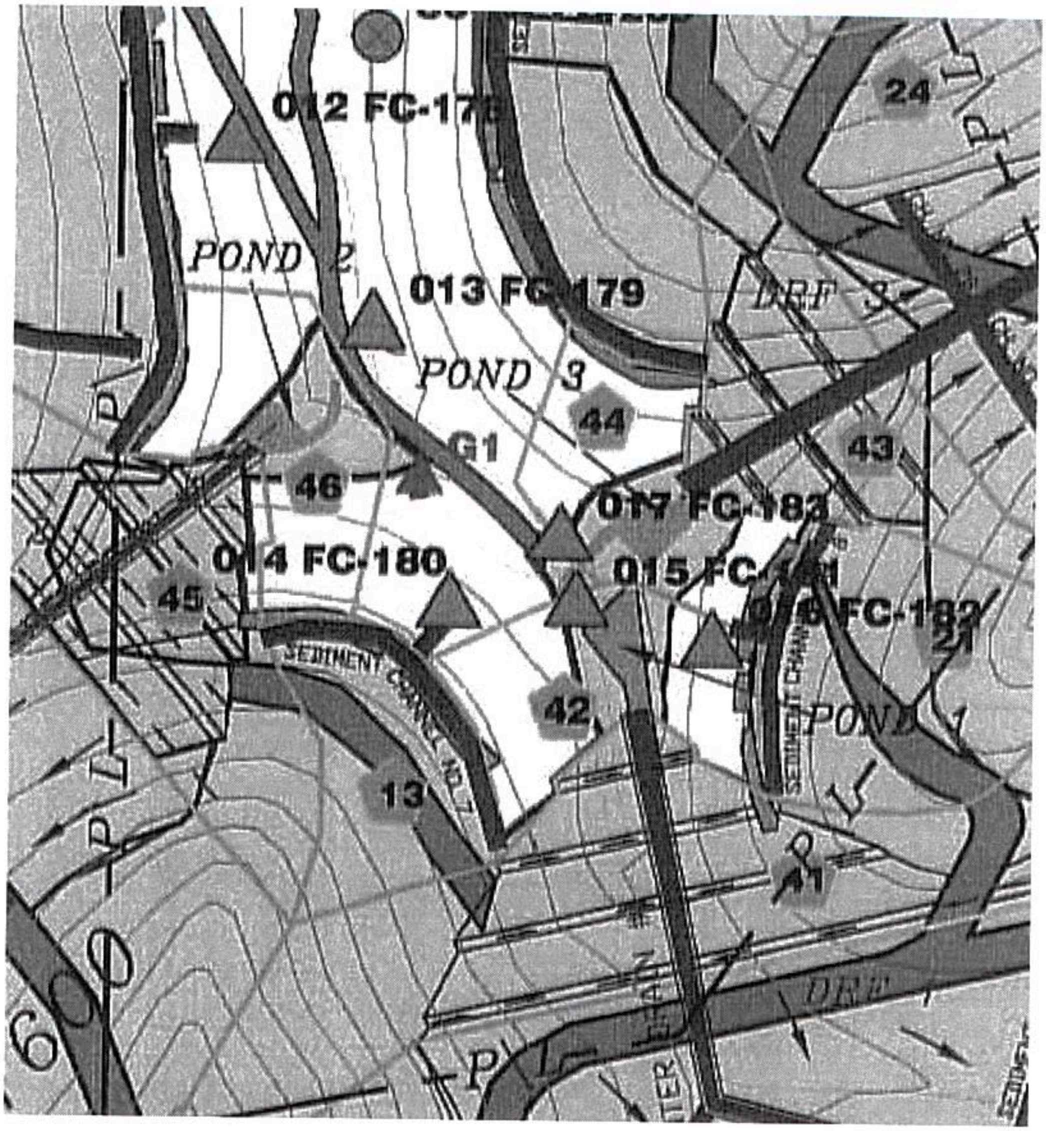
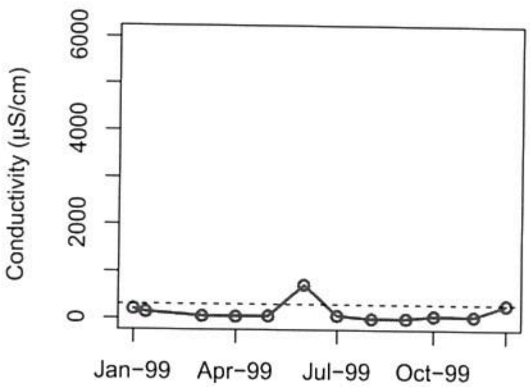


Figure 17: Location of the permitted outlets: 015 outlet from DRF1; 013 outlet from DRF2; 017 outlet DRF3. (from November 17, 2011 WV1018001 NPDES Modification 1, Exhibit 1-VI-A, showing locations of Outlets 013, 015 and 017).

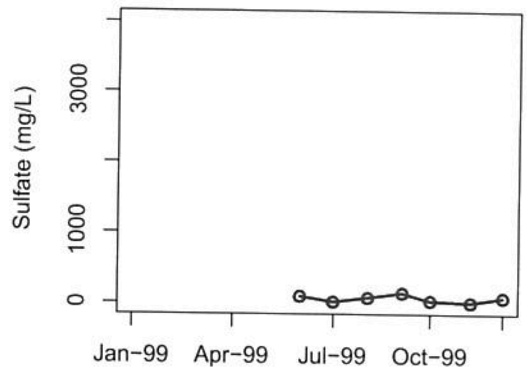
Water quality impacts

There is extensive evidence that the Surface Mine No. 6 has caused elevated levels of chemical constituents that have led to water quality problems in Cogar Hollow. In its May 11, 2000 Cumulative Hydrologic Impact Assessment prior to the issuance of Fola's permit for Surface Mine No. 6, WVDEP stated that monitoring point S-31A [sic, should be S3-1A] in Cogar Hollow was "above the influence of any mining" up to that date (S201199 CHIA, p. 17). In samples taken between January and December 1999, prior to mining, Fola measured the following levels of conductivity (in µS/cm) and sulfate (in ppm) at monitoring point S3-1A, as shown in Figure 18 (data in Appendix

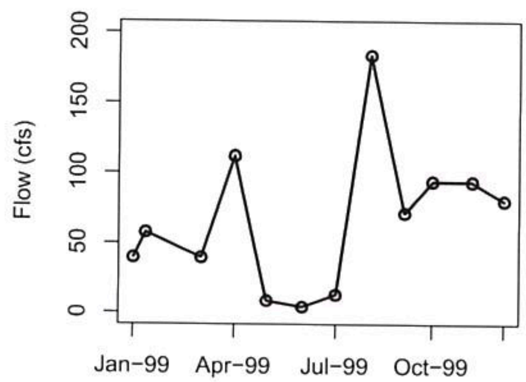
C Table 20):



(a) Cogar Hollow pre-mining conductivity



(b) Cogar Hollow pre-mining sulfate



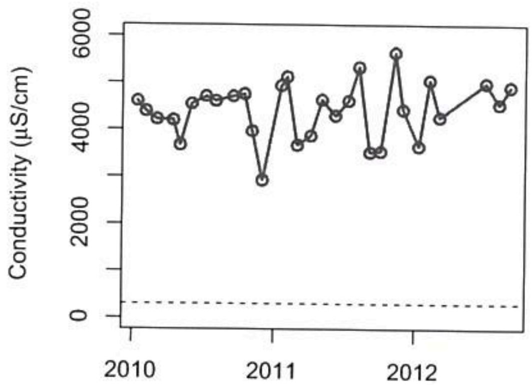
(c) Cogar Hollow pre-mining flow

Figure 18: Cogar Hollow pre-mining water quality. Source: WV1018001 Art. 3 Analysis, Source: S201199 2000 Permit application, p. J-7.g.1

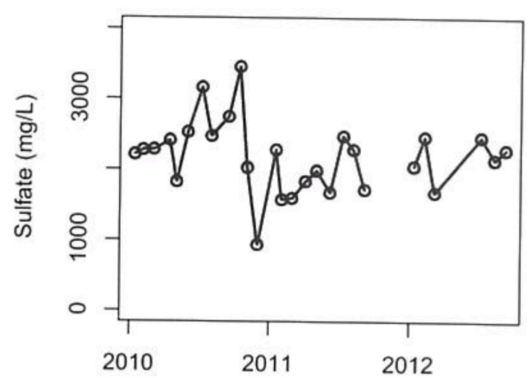
Prior to mining, Fola had a consultant conduct a benthic macroinvertebrate sampling program in March 2000 at five sites in Cogar Hollow. In the CHIA, WVDEP stated about this program that (CHIA, p. 25):

"In general, all stations provide adequate habitat and contain populations of benthic macroinvertebrates. All the stations have high EPT indexes. This index relates the total number of organisms found to the number of organisms which belong to the orders Ephemeroptera (Mayflies), Plecoptera (Stoneflies) or Trichoptera (Caddisflies). Pollution intolerant, high water quality organisms are represented by those three orders. If the percentage is high, it is safe to say in most cases that the water is of high quality."

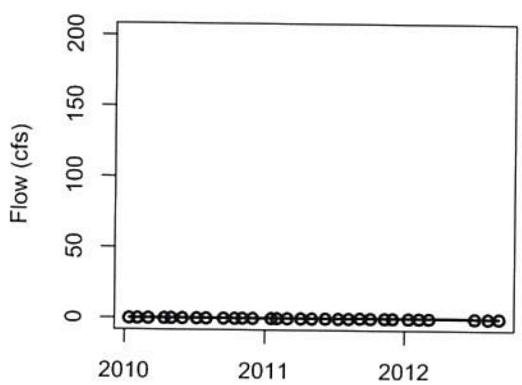
After mining began, Fola constructed three valley fills (DRFs 1, 2, and 3) in Cogar Hollow upstream from monitoring point S3-1A. Since that time, Fola has measured increased levels of conductivity and sulfate levels at monitoring point S3-1A in Cogar Hollow, as shown in Figure 19 (data in Appendix C Table 21):



(a) Cogar Hollow post-mining conductivity



(b) Cogar Hollow post-mining sulfate



(c) Cogar Hollow post-mining flow

Figure 19: Cogar Hollow post-mining water quality. Source: WV1018001 Art. 3 Analysis

The EPA benchmark for conductivity is 300 µS/cm (EPA 2011; Cormier et al. 2013). The conductivity values listed above are ten to eighteen times that level. The West Virginia DEP and others have identified sulfate concentrations of 50 mg/L as indicative of mining activity in this region. Since January 2010, SO_4 concentrations in Cogar Hollow have been extremely high ranging from 937 mg/L to over 3000 mg/L.

Source of impacts

The only land use in the Cogar Hollow watershed is coal mining. The three valley fills at Fola's Surface Mine No. 6 drain into three ponds that discharge through Outlet 013, 015, and 017 into Cogar Hollow. The water chemistry data from those outlets since October 2011 show very elevated levels of conductivity, as shown in Figure 20:

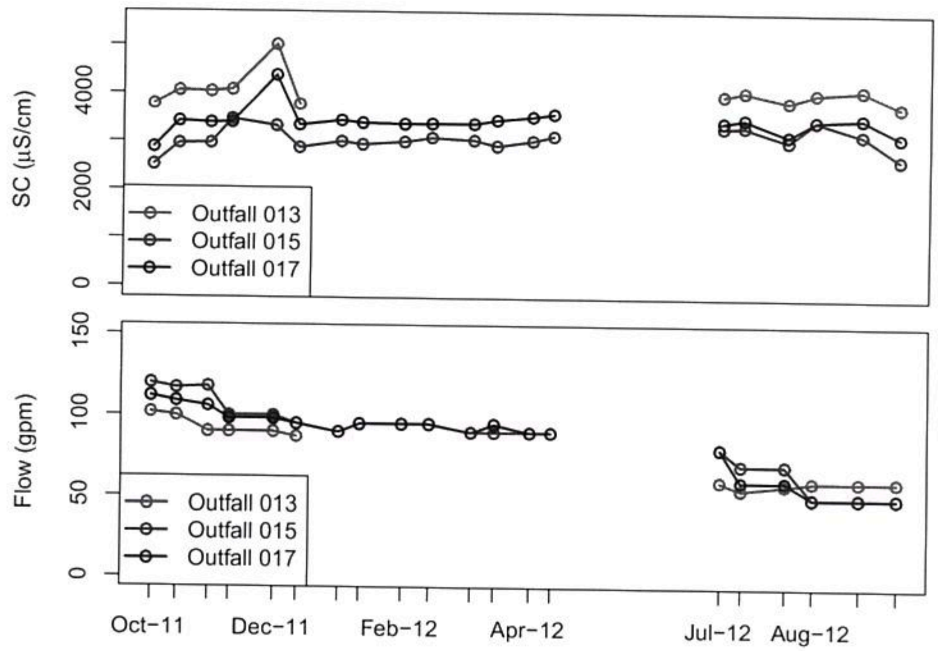


Figure 20: Water quality of outfall discharges into Cogar Hollow. Source: S201199 SM6 Outlet Data

Table 8: Chemical Composition of Alkaline Mine Drainage

Location	pH	Conductivity	Alkalinity (as CaCO3)	Hardness (as CaCO3)	Ca	Mg	Na	K	Cl	SO_4
Mine No. 6 Outlets (July 2007)	6.03	3420	66	2263	486	254	9	n/a	1	1912
Mine No. 6 Outlet 013 (6/5/12)	7.52	n/a	93	2896	n/a	448	n/a	n/a	8.93	2786
Mine No. 6 Outlet 015 (6/5/12)	7.09	n/a	123	2281	n/a	n/a	n/a	n/a	7.98	2018
Mine No. 6 Outlet 017 (5/23/12)	6.53	n/a	59	1878	n/a	284	n/a	n/a	10.24	2133
Outlet 013 (Hansen 2014)	7.73	4200	170		360	400	63	20	ND	2700
Boardtree Branch	8	2367	72	1408	241	260	12	21	11	1580

The outlet and in-stream data collected by Fola and listed in Figure 18 & 19 above demonstrate that conductivity levels have greatly increased since mining began, and that conductivity and sulfate levels have been very elevated in the discharges from Outlets 013, 015, and 017. The chemicals discharged by Fola into Cogar Hollow have an ionic signature that is characteristic of alkaline mine drainage associated with streams affected by mountaintop mining and valley fills in Central Appalachia. Table 8 above compares the discharge concentrations of those chemicals as sampled by Fola in July 2007 at Outlet 015 (as representative of all outlets) and reported by Fola in its 2008 WV/NPDES permit application (pp. 17-20), and its 2012 WV/NPDES application, and as sampled by Hansen in September 2014, with the chemicals in samples taken from Boardtree Branch by Kunz (2013).

As explained above, Kunz (2013, page 2827) found that Boardtree Branch had an "ionic signature representative of alkaline mine drainage associated with streams affected by mountaintop removal and valley fill with elevated Mg, Ca, K, HCO_3, and SO_4)."

Biological impairment

Not surprisingly given the poor water quality, the biological integrity of the stream in Cogar Hollow is impaired. On September 6, 2007, WVDEP measured the West Virginia Stream Index Score (WVSCI) score in Leatherwood Creek at mile point 9.95 just below Cogar Hollow to be 49.5. WVDEP has also measured the WVSCI score for Leatherwood Creek at other points farther downstream to be below 68 (WVDEP FOIA multi-area 11-12.xlsx, Benthics Tab, lines 56-61).

On May 9, 2014, Dr. Christopher Swan conducted biological sampling in Cogar Hollow below Outlets 013, 015, and 017 and obtained a WVSCI of 42.01, a GLIMPSS of 20.03, and an RBP of 145. His results are contained in Appendix A to this report. The habitat assessments that were performed by Dr. Swan did not find a RPB habitat result sufficiently poor to cause biological impairment of the magnitude found in this stream.

Discussion

Biological measures of stream health and Leatherwood Creek

Stream health is uniformly measured in the United States using a biological index, typically using aquatic insects including benthic macroinvertebrates. These insects vary in environmental sensitivity and integrate stream impacts over a long period of time, so their presence and abundance allow scientists to detect changes in stream health. They serve as an excellent tool for measuring overall ecological health and have been used routinely by the state of West Virginia to evaluate and rank stream condition. Macroinvertebrates in West Virginia streams that are unimpacted are extremely diverse and exhibit a range of tolerances to pollutants (Pond 2010; Pond et al. 2011).

The multi-metric West Virginia Stream Condition Index (WVSCI) is a family-level multi-metric index used to evaluate the biological condition of West Virginia streams using data from the family taxonomic level. West Virginia's standard for stream impairment is a WVSCI score that is equal to or below 68. Streams with WVSCI scores below 68 have reduced species diversity, leading to impaired stream functions, and therefore are not healthy.

A refined index for West Virginia was developed by Pond et al. (2013) – the genus-level stream index (GLIMPSS). It can better track stress and do so in different seasons and bioregions. The reason is that WVSCI assesses health based on what families of aquatic taxa are present in a stream yet families of organisms can include genera that have very different levels of tolerance to pollution. A family could be present due to the persistence of an individual belonging to only one of many genera out of many genera that are common in the region when unimpacted by mining. The Leatherwood sites are in the Central Appalachian ecoregion 69; streams with GLIMPSS scores below 53 in the spring are not healthy (Pond et al. 2013).

Leatherwood sites. Based on the data collected by Dr. Chris Swan, all three of the sites had WVSCI scores well below 68 and are thus seriously biologically impaired: Cogar Hollow= 42.01; Road Fork = 40.26; Right Fork = 38.24. The below-68 WVSCI scores and taxonomic composition for the three Leatherwood sites show that the downstream waters are dominated by highly tolerant taxa as predicted by the extensive work completed by Cormier et al. 2013. The GLIMPSS scores were also well below the level of 53 expected for a healthy stream.

Water quality impacts of surface mining

Surface coal mining and associated valley fills discharge dissolved salts such as sulfate, causing increases in the downstream conductivity (saltiness) of the water (Hartman et al. 2005; Pond et al. 2008; Palmer et al. 2010; Bernhardt and Palmer 2011; Griffith et al. 2012). These salts are formed when sulfur-laden rocks broken up during mining and dumped in valley fills react with water to form sulfuric acid, which dissolves the rock to release an ionic soup of bicarbonate, calcium, magnesium, sodium and sulfate. Aquatic insects like mayflies, which have evolved in a low-salt, freshwater environment, cannot cope with high levels of salt (Pond 2012). For these organisms, high conductivity is a chronic stressor that gradually extirpates them (Cormier et al. 2013b).

Early Scientific Studies on the Water Quality Impacts of Surface Mining

More than 20 studies over the last decade, starting with the 2005 Mountaintop Mining/Valley Fills in Appalachia Programmatic EIS, show that mining with valley fills has significant downstream consequences (see references listed with a *). Many of these showed that as mining increases, conductivity also increases, and sensitive aquatic taxa decline downstream. These articles cumulatively have more than fifty authors and have been peer-reviewed by dozens of eminent scientists.

- Pond et al. 2008 JNABS. The first major article quantifying this relationship was Pond et al.'s 2008 peer-reviewed study in the Journal of the North American Benthological Society. Pond stated in the abstract of this article:

  "We characterized macroinvertebrate communities from riffles in 37 small West Virginia streams (10 unmined and 27 mined sites with valley fills) sampled in the spring index period (March–May) and compared the assessment results using family- and genus-level taxonomic data. Specific conductance was used to categorize levels of mining disturbance in mined watersheds as low (500 µS/cm), medium (500–1000 µS/cm), or high (1000 µS/cm). Four lines of evidence indicate that mining activities impair biological condition of streams: shift in species assemblages, loss of Ephemeroptera taxa, changes in individual metrics and indices, and differences in water chemistry."

Pond et al. (2008) further found that "[o]ur results confirm that MTM impact to aquatic life is strongly correlated with ionic strength in the Central Appalachians, but habitat quality did explain some variance in MMIs and other metrics."

- Pond 2010 Hydrobiologia. In 2010, Pond published a peer-reviewed paper in Hydrobiologia which found that in eastern Kentucky:

  "[m]ean mayfly richness and relative abundance were significantly higher at REF [reference] sites compared to all other categories; MINED sites had significantly lower metric values compared to RESID [residential] and MINED/RESID sites." He further stated that "[a]nalyses from WV mining areas . . . indicated that the decline of mayflies from mountaintop mining correlates most strongly to specific conductance." (Pond 2010, lines 603-607).

  Thus, Pond found that mayflies declined or were eliminated from mined areas and that the abundance of mayflies was more closely related to conductivity than to habitat.

- Palmer et al. 2010 Science. In 2010, Palmer et al. published a peer-reviewed study in Science, considered "the" premier scientific journal, finding that as mining increased, conductivity and sulfate increased, and biological metrics as measured by WVSCI declined, including a decline in mayflies.

- Merriam et al. 2011 JNABS. Merriam et al. published a peer-reviewed paper in early 2011 in the Journal of the North American Benthic Society on the effects of mining and residential development in Central Appalachia. The paper found that:

  "mining (% of total subwatershed area) caused acute changes in water chemistry," . . . that sites affected by mining and development . . . "had lower Ephemeroptera, Plecoptera, Trichoptera richness than sites affected by either stressor alone," and that the biological impairment threshold was breached when mining activities covered about 25% of the cumulative subwatershed area (Merriam et al. 2011, Astract & p. 411). The study's authors "observed biological impairment when conductance reached 250 µS/cm." (pp. 413-14).

EPA Benchmark Study

In 2011, EPA scientists issued a report called "A Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams" (EPA 2011). The Benchmark was authored by scientists like Cormier and Suter, who had published important papers in the area of ecological causation (Cormier et al. 2010) and have a new book out on causal analysis (Cormier et al. 2014). Pond was also a contributor to the EPA benchmark report. Before publication, the Benchmark was reviewed by a scientific advisory board, which itself was composed of top scientists who possessed expertise in the area. (EPA 2011, pages xi-xii). The Benchmark was also exposed to the peer-reviewed journal review process for one of the most rigorous journals publishing chemistry and toxicology research: Environmental Toxicology and Chemistry. The following articles were published in this journal in 2013 and are described more fully below to keep with my chronological description of studies. The articles include: Cormier et al. 2013a, 2013b, 2013c; Cormier and Suter 2013a, 2013b.

The Benchmark used EPA's standard method for deriving water-quality criteria to derive a conductivity benchmark of 300 µS/cm (EPA 2011, page xiv). Under that method, EPA sets the benchmark at the level needed to protect 95% of macroinvertebrate species. Figure 8 in the benchmark graphs the species sensitivity distribution and shows that extirpation increases as conductivity increases (page 18). Five percent of species are lost when conductivity rises to 295 µS/cm, over 50% are lost at 2000 µS/cm, and close to 60% are lost at 3000 µS/cm (page 18).

As part of their work, EPA conducted a detailed causal assessment and concluded that there is a causal relationship between conductivity and stream impairment in West Virginia (EPA 2011, page 40, A-40. They conclude: "This causal assessment presents clear evidence that the deleterious effects to benthic invertebrates are caused by, not just associated with, the ionic strength of the water. . . When [other potential] causes are absent or removed, a relationship between conductivity and Ephemeropteran [, i.e. mayfly,] richness is still evident."

EPA considered potential confounding factors, including "habitat, organic enrichment, nutrients, deposited sediments, pH, selenium, temperature, lack of headwaters, catchment area, settling ponds, dissolved oxygen, and metals" (EPA 2011, page 41).

EPA found that only pH was a confounder and controlled it by removing sites with low pH (page 41). EPA concluded that: "[t]he signal from conductivity was strong so that other potential confounders that were not strongly influential could be ignored with reasonable or greater confidence" (page 41).

Post-Benchmark Studies

- Palmer and Bernhardt 2011 Ann. NY Acad Sci. After the EPA benchmark was issued, Palmer and Bernhardt published a peer-reviewed study in 2011 in the Annals of the New York Academy of Sciences. The report stated that surface mining in Central Appalachia has caused greatly increased sulfate concentrations and electrical conductivity in downstream waters, and that analysis of the West Virginia database of small streams "found that sulfate concentrations were highly correlated with conductivity, Ca, Cl, Fe, Mg, and Hardness—all of which contribute to heightened ionic stress in these impacted streams" (pp. 47-48). The report further found that this elevated conductivity leads to loss of sensitive macro-invertebrate taxa, such as mayflies in Central Appalachian streams below coal mines (p. 48).

- Lindberg et al. 2011 Proc. Nat. Acad. Sci. A extensive study with a great deal of new data was published in 2011 by Lindberg et al. in the Proceedings of the National Academy of Sciences. The study found that all tributaries draining mountaintop-mining-impacted catchments in a portion of the Upper Mud River watershed in West Virginia were characterized by high conductivity and increased sulfate concentration. Sulfate concentration "was significantly positively correlated with constituents typically derived from rock and coal weathering (SO_4, Ca, Mg, Li, Rb, and U) in the mainstem as well as the MTM-affected tributaries" (p. 2). [The study] "conclusively demonstrates that the observed increases in conductivity and Se concentration can be attributed directly to the area extent of surface coal mining occurring in the watershed"(p. 5). [The study also stated that] "the constituent weathering-derived salts that contribute to conductivity are not ameliorated nearly two decades after reclamation."

- Pond 2012 Hydrobiologia. In 2012, Pond published a peer-reviewed paper in Hydrobiologia which showed that the species composition changes dramatically as a function of land use and that conductivity was an excellent indicator of how many individuals of certain types of macroinvertebrate taxa normally abundant in Appalachian streams would be found at a disturbed site. Pond compared types of land disturbance at 94 sites in Kentucky, including mining sites, and stated in the abstract that "Core caddisfly genera (Neophylax, Pycnopsyche, Rhyacophila, Lepidostoma, and Wormaldia) were extirpated from most disturbed sites" ... "major ion concentrations (measured as specific conductance) were also highly correlated with Plecoptera and Trichoptera richness . . " (pages 11-12). . . . "TVmean [average site tolerance] was most strongly correlated with specific conductance." Pond (2012) concluded that the predominant naturally occurring stonefly genera in eastern KY headwater streams serve to indicate 'healthy' Appalachian streams and his data "revealed high rates of extirpation of many genera and entire families from headwater streams affected by varying levels of mining and residential disturbance." (page 18).

- Pond et al. 2013 Env. Mont. Assessm. In 2013, Pond et al. published a peer-reviewed paper in Environmental Monitoring and Assessment, the abstract of which "described the development, validation, and application of a geographically- and seasonally-partitioned genus-level index of most probable stream status (GLIMPSS) for West Virginia wadeable streams." He found that GLIMPSS detected greater stream impacts to benthic invertebrates than did the WVSCI method because it used a more sensitive genus-level rather than a family-level analysis. The threshold for impairment as measured by GLIMPSS is a score of 53 for the Mountain Spring category which applies to this case (Pond 2012, Table 8, p. 1532).

- Bernhardt et al. 2012. Env. Sci. Tech. In their 2012 peer-reviewed paper in Environmental Science and Technology ("How Many Mountains"), Bernhardt and colleagues found that streams receiving water from mining catchments had significantly higher conductivity than streams in unmined areas. They also found that, after screening out potential confounding factors, high conductivity was highly correlated with lower numbers of sensitive taxa and declining WVSCI scores. The study used different statistical methods than the method used in EPA's benchmark and identified the conductivity at which the greatest cumulative community diversity loss occurred as 283-308 µS/cm – remarkably similar to EPA's 300 µS/cm benchmark. They also found that this could occur when only a small fraction of a watershed was mined. The study stated in its abstract: "The extent of surface mining within catchments is highly correlated with the ionic strength and sulfate concentrations of receiving streams. Generalized additive models were used to estimate the amount of watershed mining, stream ionic strength, or sulfate concentrations beyond which biological impairment (based on state biocriteria) is likely. We find this threshold is reached once surface coal mines occupy >5.4% of their contributing watershed area, ionic strength exceeds 308 µS/cm, or sulfate concentrations exceed 50 mg/L. Significant losses of many intolerant macroinvertebrate taxa occur when as little as 2.2% of contributing catchments are mined".

EPA Peer-reviewed Journal Articles to accompany the EPA Benchmark

In 2013, Cormier and Suter published six peer-reviewed studies based on different sections of EPA's benchmark report in Environmental Toxicology and Chemistry, which is a high quality scientific journal.

- Cormier and Suter (2013a). Env. Tox. Chem. In the first study entitled "A Method for Deriving Water- Quality Benchmarks Using Field Data," they described a method for using biological and water-quality parameters to develop a field-based benchmark to protect 95% of the genera from extirpation. The use of field data is helpful where lab-based data is not available, such as where susceptible species and sensitive life stages are difficult to maintain and test in the laboratory.

- Cormier et al. 2013a. In the second study entitled "Derivation of a Benchmark for Freshwater Ionic Strength," they developed an aquatic life benchmark in West Virginia for specific conductance as a measure of ionic strength that is expected to prevent the local extirpation of 95% of species from neutral to alkaline waters containing a mixture of dissolved ions in which the mass of SO_4^{2-} HCO_3^- is greater than or equal to Cl^-. Extirpation concentrations of specific conductance were estimated from the presence and absence of benthic invertebrate genera from 2,210 stream samples in West Virginia. The study concluded that the extirpation concentration is 300 µS/cm. One of the reasons for using field data rather lab data is that Ephemeropterans (mayflies), which are the most sensitive to the ionic mixture, are not available as cultured animals for toxicity tests.

- Cormier and Suter 2013b. In the third study entitled "A Method for Assessing Causation of Field Exposure- Response Relationships," Cormier and Suter developed a weight-of-evidence method to determine how an association in the field is causal. They identified six characteristics of causation: co-occurrence, preceding causation, interaction, alteration, sufficiency, and time order.

- Cormier et al. 2013b. In the fourth study entitled "Assessing Causation of the Extirpation of Stream Macroinvertebrates by a Mixture of Ions," they applied that method to determine that the relationship between conductivity and extirpation of benthic macroinvertebrates was causal. They stated in their abstract that "a mixture containing the ions Ca^+, Mg^+, HCO_3^-, and SO_4^-, as measured by conductivity, is a common cause of extirpation of aquatic macroinvertebrates in Appalachia where surface coal mining is prevalent."

- Suter and Cormier. 2013. In the fifth study entitled "A Method For Assessing The Potential For Confounding Applied To Ionic Strength In Central Appalachian Streams," they evaluated twelve potential confounders: habitat, organic enrichment, nutrients, deposited sediments, pH, selenium, temperature, lack of headwaters, catchment area, settling ponds, dissolved oxygen, and metals. They concluded that pH, temperature, habitat, and deposited sediments were not confounding factors.

- Cormier et al. 2013c. In the sixth study entitled, "Relationship of Land Use and Elevated Ionic Strength in Appalachian Watersheds," they found that, based on a 10th quantile regression analysis, 300 µS/cm was exceeded when 3.3% or more of an area was covered by valley fills. They also confirmed that coal mining activities are the primary source of high conductivity waters.

Most Recent Studies

- Pond et al. 2014. Env. Manag. In 2014, Pond et al. published a study in Environmental Management based on data from sampling fifteen headwater streams with valley fills in Central Appalachia that had been reclaimed from eleven to thirty-three years earlier. The study found that nearly 90% of these streams exhibited biological impairment, and that valley fill sites with higher WVSCI scores were located near undisturbed tributaries that could be the sources of sensitive taxa as drifting colonists. This could explain why there are occasional passing WVSCI scores at sites when water chemistry and upstream land use would predict impairment. He stated in the abstract of his article:

  "Although these VFs were constructed pursuant to permits and regulatory programs that have as their stated goals that (1) mined land be reclaimed and restored to its original use or a use of higher value, and (2) mining does not cause or contribute to violations of water quality standards, we found sustained ecological damage in headwaters streams draining VFs long after reclamation was completed" (Pond et al. 2014. Abstract).

  His three main conclusions were that: "(1) temporal ecological impacts persist downstream of VFs, given 11-33 years post-reclamation; (2) many expected taxa were missing from VF streams (suggesting local extirpations) and the scraper feeding group was significantly reduced; and (3) water quality is most likely the primary barrier to recovery but proximity to clean sources (intervening tributaries) may contribute some sensitive taxa that increase the biological indices used to measure condition" (page 11 of the early online version of Pond et al. 2014)

  Elaborating on these three points, he further explained on pages 12-13 of the early online version of his paper that conductivity was persistent and habitat was not a confounding factor for the observed stream impairment:

  - ". . . our data indicated that highly elevated ionic concentrations may persist for over 30 years post-reclamation and that these chemical signatures result in damaged aquatic communities. Habitat can be a limiting factor, but by design, we removed significant habitat degradation factors by selecting sample reaches with relatively good habitat and intact riparian vegetation at reference and VF sites" . . .
  - "after 11-33 years post-reclamation, bioassessment indices indicated persistent temporal effects; almost 90% of our streams draining old VFs scored below impairment thresholds using GLIMPSS and O/E [observed/expected predictive model]". . .
  - "Overall, biological variation was strongly correlated with water chemistry and less by reach-scale habitat and landscape conditions. Since ion concentrations explained the greatest amount of biological impacts and were the most altered (compared to reference), this suggests that recovery is potentially hindered by ions, even in forested reaches long after reclamation. Causal analyses by Suter and Cormier (2013) provided evidence that ions (measured as specific conductance) negatively affected invertebrates despite other stressors present". . . .
  - "Cormier et al. (2013b) and Suter and Cormier (2013) provided strong causal evidence that Appalachian macro-invertebrate extirpation is linked to increasing ions (as specific

conductance), a finding supported by our study".

- Hitt and Chambers 2014 Freshw. Sci. In 2014, USGS scientists Nathaniel Hitt and Douglas Chambers published a peer-reviewed paper in the premier journal of the Society for Freshwater Science looking at the effects of mountaintop mining on fish assemblages. Among other findings they noted that most obligate invertivores were extirpated at MTM sites, indicating that conductivity effects on macro-invertebrates resulted in impacts higher up the food chain, on fish. They also found that the effects of MTM were not related to physical-habitat conditions but were associated with water-quality variables, which may limit quality and availability of benthic macroinvertebrate prey.

Laboratory Tests on Reconstituted Mine Discharges

- Kennedy et al. 2004. Env. Mon. Assess. In 2004, Kennedy et al. published a peer-reviewed paper in Environmental Monitoring and Assessment which tested simulated coal mine discharge waters in Ohio with a mayfly Isonychia bicolor. The ionic matrix was dominated by sulfate, bicarbonate and sodium. In seven-day lethality tests, the lowest observed effect concentrations for survival were 1,582, 966 and 987 µS/cm in three tests. These values bracket the field-derived XC95 extirpation value of 1,180 µS/cm.

- Kunz et al. 2013 Env. Tox. Chem. In 2013, Kunz et al. published a peer-reviewed paper in the journal Environmental Toxicology and Chemistry which found that reconstituted mine waters with an ionic composition characteristic of mountaintop-mining-impacted streams in West Virginia were consistently toxic to the mussel, amphipod and mayfly. These waters were toxic to the mayfly at a conductivity of about 800 to 1300 µS/cm, which is consistent with the field-derived XC95 extirpation concentration for the same genus of 1092 µS/cm.

Summary of Scientific Research to Date

Together with the Benchmark, dozens of scientists in the field of ecology and ecological causation have reviewed the evidence establishing that conductivity in mine drainage is a cause of biological degradation in Appalachian streams. All of the science has passed peer review, or the EPA's Scientific Advisory Board. The studies used a scientifically valid method of causal assessment. The primary data source used by EPA and Cormier et al. for evidence of confounding is West Virginia's watershed analysis database which means that it is highly relevant to Leatherwood Creek. The weight of evidence indicates that habitat, temperature, and sedimentation are not confounding factors in West Virginia mine sites generally or in this case specifically. There are no peer-reviewed studies that contradict any of these studies.

The studies clearly show that levels of conductivity above ~ 300 µS/cm and elevated sulfate levels are common below Appalachian mine sites and lead to extirpation of invertebrate genera (EPA 2011; Cormier and Suter 2013; Cormier et al. 2013a) and that the ions found coming out of the outlets at mines Fola No. 2, 4A, and 6 are consistent with those associated with coal mining pollution in this region (Pond et al. 2008; Palmer et al. 2010; Bernhardt and Palmer 2011; Lindberg et al. 2012;Pond et al. 2012; Pond et al. 2013; Pond et al. 2014). The ionic mixture of calcium, magnesium, sulfate, and biocarbonate in circumneutral mine water causes the loss of aquatic macroinvertebrates in Appalachian areas where surface coal mining is prevalent; it is the mixture of ions that causes the biological impairment (Cormier et al. 2013b; Comier and Suter 2013). These ions also lead to reductions in fish assemblages in the affected streams (Hitt et al. 2014).

Multiple scientific methods have been used in these different studies by different scientists to reach the same conclusion about the causal link between conductivity and downstream impairment. First, the EPA Benchmark used a species sensitivity distribution to model the conductivity level at which different genera are extirpated, and determined that 5% of taxa are lost at 300 μS/cm (pp. 18-19). Second, the EPA Benchmark modeled conductivity against WVSCI scores, and determined that 300 μS/cm corresponded to a failing WVSCI score (p. A-36). Third, the Benchmark used a logistic regression, and found that the probability of impairment, as measured by WVSCI, was 59% at 300 μS/cm and 72% at 500 μS/cm (p. A-36). Fourth, Bernhardt et al. (2012) used a different statistical method called TITAN to reach the same conclusion.

Conclusions

The in-stream and outlet data for Right Fork, Road Fork and Cogar Hollow show that ionic concentrations were historically low and have increased over time since mining began. The ionic mixture in discharge water after mining began has the ionic signature that is characteristic of alkaline mine drainage associated with streams affected by mountaintop mining and valley fills in Central Appalachia. The only source of conductivity and ionic pollutants at the three sites are mine discharges. The chemical and biological monitoring data from these sites, including the absence of mayflies and other sensitive taxa, provide indisputable scientific evidence that mining operations and associated discharges of ionic chemicals like sulfate from the outlets at Fola's Surface Mines No. 2, 4A and 6 are causing significant biological impairment to those three tributaries, respectively. The WVSCI scores are all well below the passing score of 68. The GLIMPSS scores are well below the passing score of 53. Levels of chemical pollution are very high and biological impairment serious, yet habitat is not sufficiently poor to have caused the level of biological impairment.

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Declaration

I declare under penalty of perjury that the foregoing is true and correct.

Date: September 23, 2014

Margaret A. Palmer

Qualifications as an Expert Witness: see attached curriculum

Materials Reviewed

Doc. No.	Fola Mine No.	Permit	Date	Description	Image File #	Page
1	2	WV1013840	8/13/07	Permit Application	56	87-103
2	2	WV1013840	8/13/07	NPDES Reissuance/ GPP Map (excerpt)		FOLA2and6-000101
3	2	WV1013840	9/13/13	Site Location Map		FOLA2and6-000191
4	2	WV1013840	1/17/14	WV/NPDES Permit		
5	2	S201293	9/3/10	WV/SMCRA Permit	371	2
6	2	S201293	6/28/94	CHIA	176	136-141
7	2	S201293	2/17/94	Permit Application	154	469-470, 490
8		U200405	2/22/09	Permit Application	OMR_U200405_SMA_1_1284	Baseline Surface Water Analysis.pdf
9	2	WV1013840	2010-2012	Art. 3 Analysis		
10	2	WV1013840	1/4/00	Permit Application	41	144-207
11	2	WV1013840	3/28/03	Permit Application	45	198-215
12	2	WV1013840	2011-2012	Outlet 001 analysis		FOLA2and6-002556-002557
13	2	WV1013840	2011-2012	Art 3 Analysis		

14			12/12/12	WVDEP FOIA multi-area 11-12.xlsx		
15			6/6/12	WVDEP Final Approved Elk TMDL Report		
16			9/9/11	WVDEP Final Elk Selenium TMDL Allocations		
17	2	WV1013840	3/30/12	REIC report		FOLA2and6-000102-000131
18	2	WV1013840	9/13/13	EnviroScience report		FOLA2and6-000132-000187
19	2	WV1013840	9/13/13	EnviroScience report		FOLA2and6-000188-000247
20	2		8/17/11	REIC Report, Appendix E		FOLA2and6-000077-78, 000092
21	4A	S200502	5/8/03	CHIA	69	58-89
22	4A	WV1013815	7/22/03	Stream Delineation Map		FOLA#4A002551
23	4A	WV1013815	7/15/05	Drainage Map	67	
24	4A	S200502	1/28/03	Flow Diagram	22	
25	4A	WV1013815		Site Location Map		FOLA#4A000841
26	4A	WV1013815	1/17/14	NPDES Permit		
27	4A	S200502	2/11/14	WV/SMCRA Permit		
28	4A	WV1013815	7/22/03	NWP 21 Authorization		FOLA#4A002119-2122

29	4A	S200502	2/26/02	AOC Process Report	68	FOLA#4A002234-2236
30	4A	S200502	Jan-03	Project Purpose Statement		FOLA#4A002561-2563
31	4A	S200502	1/24/03	Permit application	82	25.181, 25.191-25.193
32	4A	WV1013815		Biological survey		FOLA#4A001826-1828
33	4A	S200502	7/12/01	Potesta Report		FOLA#4A001868-91, 1930-33, 1925, 1988-89, 2020-27
34	4A	S200502	2008-2013	Art. 3 Analysis		FOLA#4A000169, 303-04, 307-08, 315-17, 352-71, 409-15
35	4A	S200502	2008-2013	Art. 3 Analysis		FOLA#4A000170-72, 177-78, 180-86, 211-15, 226-36, 266-69, 280-88, 317-19, 331-39, 371-74, 384-96, 415-16, 419-23, 1299-1300, 1310-11, 1056-57, 1289-90, 1644-45
36	4A	WV1013815	11/26/12	EnviroScience Report		FOLA#4A000098-161
37			2002-2012	WVDEP Habitat Assessments for Leatherwood Creek		FOLA#4A000842, 846-47, 861, 865-66, 872, 876-77, 904, 908-09, 918, 922-23, 935, 939-40, 948, 952-53, 965, 969-70, 976, 980-81, 992, 996-97, 884, 888-89
38	6	S201199	4/24/00	Drainage map	43	

39	6	S201199	1/19/00	Flow diagram	42	
40	6	WV1018001	2/18/08	NPDES permit	5	Apr-54
41	6	WV1018001	6/16/14	NPDES permit extension		
42	6	S201199	1/24/11	WV/SMCRA permit	328	2
43	6	S201199	5/11/00	CHIA	99	312-46
44	6	S201199	2/15/00	Permit Application	100	57 (J.7.g.1)
45	6	S201199	3/10/00	Potesta Report	100	460-89 (K-40 to K-69)
46	6	WV1018001	2010-2012	Art. 3 Analysis		
47	6	S201199	2011-2012	SM6 Outlet Data		FOLA2and6-002570-002581
48			1997	WVDEP Elk River Watershed Assessment		
49		WV1018001	2008	Fola Permit Application		
50	2 and 2-A		Aug. 15, 2014	EnviroScience Report		

Appendix A: Benthic Sampling by Dr. Christopher Swan on May 9, 2014

				Site 1 PA45560	Site 2 PA45561	Site 3 PA45562
SPECIES	T.V.	F.F.G.		Cogar Hollow	Road Fork	Right Fork
MOLLUSCA						
Gastropoda						
Basommatophora						
Physidae	8	SC			8	
ANNELIDA						
Oligochaeta	10	CG				
Enchytraeidae	10	CG		6		2
Lumbriculida						
Lumbriculidae	8	CG				4

ARTHROPODA						
Crustacea						
Ostracoda	8	CG			5	
Insecta						
Odonata						
Aeshnidae	3	P			1	
Gomphidae	3	P			1	
Trichoptera						
Hydropsychidae	4	FC	CL	9	47	6
Hydroptilidae	4	PI		16		4
Philopotamidae	3	CF	CL			22
Rhyacophilidae	3	P	CL			1
Coleoptera						
Elmidae	4	CG	CL		2	2
Staphylinidae	8	P	CL	1		
Diptera	6			2		
Ceratopogonidae	6	P		13	4	
Chironomidae	6	CG		44	82	119
Empididae	6	P		4	2	32
Clinocera sp.	6	P	CL			
Hemerodromia sp.	6	P				
Neoplasta sp.	6	P				
Simuliidae	6	FC	CL		26	2
TOTAL NO. OF ORGANISMS				**95**	**178**	**194**
TOTAL NO. OF TAXA				**8**	**10**	**10**
EPT FAMILIES				**2**	**1**	**4**
%EPT				**26.32%**	**26.40%**	**17.01%**
% CHIRONOMIDAE				**46.32%**	**46.07%**	**61.34%**
%2 DOMINANT FAMILIES				**63.16%**	**72.47%**	**77.84%**
FAMILY LEVEL HBI				**5.75**	**5.56**	**5.6**
MBI maximum 25 individuals per taxa				**2.15**	**3.88**	**5.17**
STATION SCI SCORE				**42.01**	**40.26**	**38.24**
STATION RBP SCORE				**145**	**163**	**172**

Appendix B: Data from Fola benthic sampling

Benthic sampling from the 2001 Potesta report (FOLA#4A001883-84, 1890, 1925, 1930-33, 1988-89, 2022-27) and the 2012 EnviroScience report (FOLA#4A000111-112, 135-136, 160)

ORDER	FAMILY	GENUS/ SPECIES	FOLA-6 (m/d/yr)				FOLA-7 (m/d/yr)				BASD1RLW	
			11/ 18/ 99	3/ 8/ 00	1/ 16/ 00	3/ 28/ 01	11/ 18/ 99	3/ 8/ 00	11/ 16/ 00	3/ 27/ 01	Kick 5/ 7/ 12	Multi 5/ 7/ 12
Ephemeroptera	Baelidae	*Baetis*		1				7		1		
	Ephemerelidae	*Eurylophella*	8									
		Drunella				3						
		Serratella						3		1		
	Heptageniidae	*Stenonema*				1			1	2		
		Epeorus						3				
	Isonychidae	*Isonychia*			1	1						
Plecoptera	Capniidae						48					
		Allocapnia			10				40			
	Leutridae	*Leuctra*	8	5			88					
	(early instar)											2
	Nemouridae	*Amphinemura*		1				8		15		1
	Perlidae						176					
		Acroneuria				1				4		
		Paraggnetina	32									
	Perlodidae	*Isoperla*		4				20	4	4		
	Taenioplerygidae	*Taeniopteryx*	456	2	20		792		11	2		
		Oemopteryx		131				46				
Trichoptera	Hydroptilidae	*Hydroptila*			2						4	1
	Hydropsychidae	*Diplectrona*				2	4			2		
		Chematopsyche	48	22		1	20	14	4	3		
		Potamyia		9				2				
		Ceratopsyche			10							
		Hydropsyche				1		9				2
	Limnephilidae	*Hydatophylax*		1								
	Philopotamiidae	*Chimarra*				1		1	9	6		
		Dolophilodes			3	1						
		Wormaldia						1				
	Polycentropodidae	*Polycentropus*								1		
	Uenonidae	*Neophylax*		2						2		
	Rhyacophiideae	*Rhyacophilia*						1				
	Lepidostomatidae	*Lepidostoma*						1				
Diptera	Ceratopogonidae						12					
		Bezia/Palpomyia										1
		Dasyhelea										5

		Forcipomyia										1
	Chironomidae		184	48	19	47	128	89	6	42		
		Tanytarsus										1
	Diamesinae	*Diamesa*									1	
	Empididae	*Hemerodromia*			8	6			16	5	8	9
		Cinocera										2
	Ephydridae	*Ephydra*		2								
	Orthocladiinae	*Cricotopus*									29	65
		Eukiefferiella										1
		Orthocladius										11
		Parametriocnemus										1
	Simuliidae	*Prosimulium*		1								
		Simulium								1		
	Tanypodinae	*Procladius*										1
	Tipulidae	*Tipula*	12	6		2		1		1		1
		Pseudolimnelphia				1						
		Molophilus		2				1				
		Antocha						20			1	
Coleoptera	Georyssidae	*Georyssus*		1								
	Elmidae		12	1			40					
		Oulimnius			2				1			
		Optioservus		32	5	2		13	25	7	2	
	Psephenidae	*Ectopria*		1						1		
Odonata	Aeshnidae											7
	Gomphidae	*Arigomphus*			2							
		Stylogomphus									1	
	Cordulegastidae	*Cordulegaster*		1	1							
Megaloptera	Corydalidae	*Nigonia*	8		1			2	1			
Acariformes	Sperchonidae	*Sperchon*										1
Collembola	Entomobryidae					1		1				
Decapoda	Cambaridae	*Cambarus*						1				
Hemiptera	Veliidae	*Rhagovelia*										1
Oligochaeta			16		12	12	180	1	10	6	4	3
# EPT Taxa							**9**			**9**	**1**	
# Total Taxa							**16**			**19**	**7**	
# Total Individuals							**103**			**115**	**50**	**117**
Conductivity			**736**	**556**	**742**	**461**	**940**	**539**	**717**	**367**	**1740**	**1740**
Sulfate			**280**	**152**	**152**	**120**	**792**	**476**	**512**	**232**	**942**	**942**
WVSCI						**59**				**70**	**30**	**30**

RBP					**131**				**140**		**141**	**141**

Appendix C: Data used in figures

Table 12: Pre-mining data in Road Fork

Sample Date	Conductivity (uS/cm)	SO_4 (mg/L)	Flow (cfs)
7/27/1992	49	14	
7/27/1992	43	11	
8/26/1992	43	0.01	0.11
8/26/1992	43	11	0.11
9/2/1992	46	8	0.18
10/7/1992	58	9	0.03
11/19/1992	40	3	0.03
12/7/1992	49	5	0.08
1/13/1993	73	30	0.13

Table 13: Post-mining data in Road Fork

Date	Conductivity	Sulfate	Flow (cfs)
1/29/2004	1029	195	0.84
2/27/2004	3050	500	1.09
3/30/2004	2970	640	1.31
4/27/2004	1500	600	1.23
5/28/2004	1562	155	2.67
6/30/2004	2926	1120	0.94
7/29/2004	3000	1450	0.94
1/4/2005	244	14	1.31
1/20/2005	107	33	1.31
3/25/2005	2112	1555	
4/28/2005	2600	950	1.13
5/26/2005	3168	1350	1.2
6/28/2005	3063	865	1.21
1/13/2010	4160	1852	0.488
2/4/2010	4400	1810	0.622
3/4/2010	2415	1310	0.448
4/15/2010	5700	3304	0.642
5/3/2010	2830	1437	0.644
6/1/2010	4070	2090	0.689
7/8/2010	4390	2552	0.442
8/2/2010	4610	1996	0.421
9/16/2010	4960	2188	0.422
10/15/2010	4680	2069	0.442
11/4/2010	4480	2040	0.466
12/1/2010	1821	886	0.688
1/18/2011	3840	1795	0.441
2/2/2011	3820	1091	0.688
3/1/2011	1803	1042	0.688
4/5/2011	3420	1679	0.688
5/4/2011	3230	1628	0.442
6/8/2011	4630	1383	0.344
7/12/2011	3290	2079	0.644
8/8/2011	4650	2164	0.686
9/6/2011	2920	1457	0.889
10/4/2011	3460		0.688
11/10/2011	4410		0.446
12/1/2011	4140		0.844

Table 13: (cont'd) Post-mining data in Road Fork

Date	Conductivity	Sulfate	Flow (cfs)
1/11/2012	4260	1703	0.622
2/8/2012	4000	1365	0.642
3/5/2012	2520	1561	0.844
4/5/2012	3720	2099	0.446
5/9/2012	3820	1697	0.668
6/12/2012	4260	2006	0.442
7/3/2012	4880	2196	0.468
8/7/2012	3860	1873	0.466
9/5/2012	3220	1531	0.542

Table 14: Outlet 001 Data

Date	Conductivity	Sulfate	Flow (gpm)
1/13/1999		96	
9/3/2002		1300	
10/5/2011	2560		89
10/17/2011	2920		90
11/1/2011	2970		90
11/11/2011	3310		90
12/2/2011	4470		90
12/15/2011	2850		90
1/2/2011	2910		93
1/12/2012	3140		92
2/1/2012	3210		90
2/14/2012	2060		92
3/5/2012	2830		95
3/15/2012	3070		93
4/2/2012	3280		92
4/12/2012	3380		94
7/2/2012	2920		90
7/12/2012	3400		87
8/2/2012	2580		88
8/15/2012	3070		88
9/6/2012	3110		85
9/17/2012	3150		84
5/9/2014	2929		

Table 15: Post-mining water quality, habitat, and WVSCI in Road Fork

Parameter	Date	Downstream of Outlet 001	Upstream of Road Fork on LWC	Downstream of Road Fork on LWC
Conductivity	5/24/2011	3200	2110	2350
Conductivity	5/21/2012	2700	2500	2280
Conductivity	5/20/2013	2530	1800	2010
Conductivity	5/19/2014	2710	2000	2120
Sulfate	5/24/2011	1860	1020	1230
Sulfate	5/21/2012	1860	1360	1600
Sulfate	5/20/2013	1970	1200	1420
Sulfate	5/19/2014	1620	1130	1230
WVSCI	5/24/2011	46.43	40.61	46.62
WVSCI	5/21/2012	50.1	39.6	42.2
WVSCI	5/20/2013	43.25	39.7	45
WVSCI	5/19/2014	56.8	34.7	37.9
RBP	5/24/2011	119	93	115
RBP	5/21/2012	124	147	146
RBP	5/20/2013	124	144	146
RBP	5/20/2014	123	143	146

Table 16: Water quality in Right Fork tributary in 1999-2000 prior to beginning Mine 4A; Measurements by Fola Mine (Source: S200502 2003 Permit Application, pp. 25.181, 25.191 to 25.193).

Date	P-9 Cond	P-9 Sulf	P-9 Flow	P-10 Cond	P-10 Sulf	P-10 Flow	P-11 Cond	P-11 Sulf	P-11 Flow
10/31/2000	307	90	0.1	1156	440	0.52			
9/29/2000	218	74	0.21	406	112	0.89	638	148	0.93
8/31/2000							538	48	0.91
8/30/2000	128	44	0.41	550	140	1.36			
7/28/2000							732	180	0.93
7/19/2000	1392	200		1560	186	1.05			
6/30/2000	516	120	0.49	767	148	1.26			
6/22/2000							343	88	1.83
5/26/2000							627	180	0.56
5/19/2000	1180	480	0.25	1180	440	1.01			
4/29/2000							76	17	0.83
4/27/2000	279	76	0.29	207	74	1.06			
3/30/2000							464	152	1.09
3/28/2000	35	25	0.31	384	128	1.07			
2/25/2000							366	100	0.93
2/21/2000	180	62	0.46	168	45	1.39			
1/27/2000							603	280	0.71
1/26/2000	241	75	0.13	354	78	0.64			
12/31/1999							650	200	0.86
12/29/1999	212	80	0.79	336	80	0.09			
11/30/1999	375		0.11	365		0.87	549	155	0.71
10/27/1999							813	340	0.71
10/25/1999				870	300	0.65			
9/14/1999	317	88	0.16				779	250	0.52

Table 17: Water quality in Right Fork tributary in 2008-2011 after mining began for Mine 4A; Measurements by Fola Mine (Source: S200502 Art. 3 Analysis, pp. FOLA4A#000177-001645)

Date	DCCH P-9 Cond	DCCH P-9 Sulf	DRFLC P-10 Cond	DRFLC P-10 Sulf	DRFLC P-11 Cond	DRFLC P-11 Sulf
5/15/2008			705	368	1334	735
6/12/2008			1214	618	1630	827
7/16/2008			1360	700	1643	862
8/15/2008	1106	618	1636	867	2700	1442
8/26/2008	1209	742	1836	1031	2980	1691
9/10/2008	1237	798	1756	1126	1723	1163
10/15/2008	1359	781	1716	812	3320	1721
11/14/2008	1224	688	1964	918	1752	870
11/25/2008	1224	675	1950	962	1750	871
12/11/2008	614	225	1065	491	1005	445
12/31/2008	918	505	1779	808	1628	965
1/13/2009	757	300	1667	894	1496	782
1/26/2009	514	77	1385	803	1093	385
2/4/2009	746	346	1850	985	1306	660
2/16/2009	935	519	1871	1036	1600	886
3/10/2009	904	509	1877	1008	1578	819
4/9/2009	746	369	1694	900	1308	673
5/6/2009	654	314	1442	737	1081	550
6/11/2009	1000	477	1630	764	1430	719
7/7/2009	1311	742	3290	1236	1989	1116
8/12/2009	688	325	1208	618	1036	516
9/3/2009	1028	565	1959	1120	1977	993
10/6/2009	1097	593	3320	1246	1917	1101
11/6/2009	1010	488	3130	1049	1772	870
12/3/2009	992	522	1496	782	1378	6
1/13/2010	1056	564	2770	1096	1728	1505
2/4/2010	961	492	1967	1144	1645	890
3/4/2010	1113	509	2809	1085	1592	1022
4/15/2010	1235	676	2950	1267	1860	1065
5/3/2010	986	495	1296	653	1042	504
6/1/2010	1417	824	2900	1196	1884	1056
7/8/2010	1452	963	3120	1308	2720	1412
8/2/2010	1188	640	2390	1074	1902	1003

Table 17: (cont'd) Water quality in Right Fork tributary in 2008-2011 after mining began for Mine 4A; Measurements by Fola Mine (Source: S200502 Art. 3 Analysis, pp. FOLA4A#000177-001645)

Date	DCCH P-9 Cond	DCCH P-9 Sulf	DRFLC P-10 Cond	DRFLC P-10 Sulf	DRFLC P-11 Cond	DRFLC P-11 Sulf
9/16/2010	1638	888	2920	1498	2840	1337
10/15/2010	1458	776	3140	1276	2830	1219
11/4/2010	1156	606	2690	1129	1806	964
12/1/2010	894	420	1263	575	1204	573
1/18/2011	1272	656	3140	822	1863	881
2/2/2011	900	481	1733	952	1368	706
3/1/2011	670	311	1434	726	1042	495
4/5/2011	1100	567	2980	1221	1739	960
5/4/2011	1796	980	2790	1869	1631	925
6/8/2011	3260	1257	2840	897	2370	1180
7/12/2011	1288	618	1912	1017	1836	882
8/8/2011	1520	840	2840	1263	1848	1017
9/6/2011	1284	623	1809	751	1605	717
10/4/2011	1302	662	1959	1088	1780	977
11/10/2011	2700	1030	2940	1339	2580	1277
12/1/2011	1720	976	2780	1159	1744	918
1/11/2012	1802	954	2880	1264	2010	1083
2/8/2012	1686	871	2210	1179	1826	1031
3/5/2012	1328	1032	1820	815	1499	488
4/5/2012	2990	1192	3240	1321	1898	1073
5/9/2012	1632	852	1912	977	1619	814
6/12/2012	1868	939	3010	1494	2250	1183
7/3/2012	1890	1155	3120	1203	3220	1394
8/7/2012	1628	1123	2210	1206	2220	1128
9/5/2012	1220	643	1826	1012	1654	878
10/2/2012	1616	924	2140	1223	1958	1114
11/13/2012	1676	963	2410	1437	2160	1255
12/10/2012	1054	521	1682	914	1239	705
1/10/2013	1598	875	2320	1385	1964	1143
2/7/2013	1283	668	3030	1221	1691	900
3/6/2013	1691	982	3010	1298	1947	1107
4/1/2013	1316	680	3310	1208	1688	923
5/14/2013	1620		2380		1790	1150
6/10/2013	1500		1920		1610	1000
7/3/2013	1550		1940		1760	1060
8/1/2013	1350		1730		1500	1030
9/3/2013	1300		1540		1360	1030

Table 18: Water chemistry from Outfalls 22, 23, 27

	Outfall 22		Outfall 23		Outfall 27	
Date	Cond	Flow	Cond	Flow	Cond	Flow
8/28/2008					2270	73
9/19/2008					1674	23.8
10/5/2011	1438	164	2840	152	1934	57
10/17/2011	1774	160	3490	150	2220	54
11/1/2011	1730	160	2630	150	3970	57
11/11/2011	1884	150	2790	140	2420	50
12/2/2011	1649	165	3450	1.5	2220	52
12/13/2011	1771	160	3450	150	2210	50
1/2/2012	1874	160	3570	140	2150	50
1/12/2012	1791	164	3590	160		0
2/1/2012	1817	164	3610	160	624	57
2/14/2012	1833	160	2840	160	614	57
3/5/2012	1759	160	2800	155	490	55
3/16/2012	1683	160	1693	155	2250	55
4/2/2012	1884	164		0	2300	57
4/12/2012	1958	164		0	2330	57
5/2/2012	1914	164	3410	152	2680	57
5/14/2012	1474	164	2210	152	2080	57
6/4/2012	1797	160	2760	150	2240	57
6/15/2012	1855	150	2840	140	2230	50
7/2/2012	1848	150	2800	130	2240	50
7/12/2012	1944	150	2890	140	2300	50
8/2/2012	1848	160	2370	150	1379	55
8/15/2012	1690	160	3540	130	2070	40
9/6/2012	1886	170	3430	140	2360	40
9/24/2012	1594	170	2710	140	1756	40
10/3/2012	2270	170	2680	140	2010	45
10/24/2012	1785	170	2280	140	2210	45
11/5/2012	1949	180	2880	170	1796	50
11/15/2012	1798	170	2850	170	2040	50
12/4/2012	1789	160	2840	170	2360	60
12/14/2012	1876	1.7	2960	120	2490	60
1/4/2013	1577	160	2790	150	2120	60
1/14/2013	1584	160	2800	160	2130	60
2/4/2013	1782	160	2440	160	1957	60
2/15/2013	1146	170	3330	170	2870	80
3/1/2013	3920	170	4180	170	3200	80
3/11/2013	4750	160	3130	160	3450	80
4/1/2013	1593	160	2629	160	1490	80
4/11/2013	1703	160	2898	160	2295	80

Table 19: Potesta Report from 2000-2001 (pre-Fola 4A mine) for biological and water quality in Right Fork tributary.

Site	WVSCI		Conductivity		RBP	Fish Species	
	2000	2001	2000	2001	2000	2000	2001
	Fall	Spring	Fall	Spring	Fall	Spring	Spring
Fola-4	70	57	1560	847	154	23	14
Fola-5	53	35	1825	1048	132	14	11
Fola-6	86	59	742	461	131		
Fola-7	69	70	717	367	140	4	6
Fola-8	90	92	251	197	124		
Fola-9	89	91	110	80	150	1	1
Fola-10	89	86	90	70	140		
Fola-11	70	56	750	397	141		
Fola-12	85	68	80	59	148	3	3
Fola-13	88	92	100	46	144		
Fola-14	77	80	80	38	117		
Fola-15	94	92	70	48	160	2	2
Fola-16	Dry	67	Dry	39	Dry		
Fola-17	82	79	1620	398	155	2	3
Fola-18	89	78	2093	1048	138	2	2
Fola-19	92	87	2025	943	144		
Fola-20	91	75	95	50	160		

Table 20: Pre-mining water quality at Cogar Hollow, monitoring point S3-1A

Date	Conductivity	Sulfate	Flow (cfs)
1/29/1999	207		40
2/9/1999	141		58
3/31/1999	54		40
4/30/1999	48		112.3
5/29/1999	57		9
6/30/1999	720	95	4.5
7/30/1999	67	17	13.5
8/30/1999	2	76	184
9/30/1999	4	144	72
10/25/1999	62	33	94.3
11/30/1999	49	8	94
12/29/1999	295	80	80.8

Table 21: Post-mining water quality at Cogar Hollow, monitoring point S3-1A

Date	Conductivity	Sulfate	Flow (cfs)
1/13/2010	4610	2212	0.114
2/4/2010	4390	2275	0.089
3/4/2010	4220	2282	0.101
4/15/2010	4200	2413	0.088
5/3/2010	3670	1830	0.112
6/1/2010	4550	2528	0.124
7/8/2010	4710	3167	0.121
8/2/2010	4610	2473	0.101
9/16/2010	4710	2748	0.121
10/15/2010	4760	3459	0.114
11/4/2010	3970	2029	0.164
12/1/2010	2930	937	0.144
1/18/2011	4940	2278	0.112
2/2/2011	5130	1579	0.112
3/1/2011	3670	1600	0.144
4/5/2011	3870	1838	0.154
5/4/2011	4640	1988	0.124
6/8/2011	4300	1682	0.164
7/12/2011	4620	2473	0.121
8/8/2011	5340	2282	0.144
9/6/2011	3520	1726	0.424
10/4/2011	3540		0.201
11/10/2011	5650		0.211
12/1/2011	4430		0.268
1/11/2012	3650	2053	0.201
2/8/2012	5060	2465	0.211
3/5/2012	4270	1686	0.224
7/3/2012	5000	2464	0.211
8/7/2012	4550	2146	0.154
9/5/2012	4920	2288	0.201

Table 22: Water chemistry data from Outlets 013, 015, 017 which drain into Cogar Hollow.

Date	Outfall	Conductivity	Flow (gpm)
10/5/2011	13	3780	102
10/17/2011	13	4060	100
11/1/2011	13	4040	90
11/11/2011	13	4080	90
12/2/2011	13	5020	90
12/13/2011	13	3780	87
7/2/2012	13	4000	60
7/12/2012	13	4080	55
8/2/2012	13	3880	58
8/15/2012	13	4050	60
9/6/2012	13	4120	60
9/24/2012	13	3770	60
10/5/2011	15	2520	120
10/17/2011	15	2960	117
11/1/2011	15	2970	118
11/11/2011	15	3470	100
12/2/2011	15	3330	100
12/13/2011	15	2880	95

Table 22: (cont'd)

Date	Outfall	Conductivity	Flow (gpm)
1/2/2012	15	3012	90
1/12/2012	15	2950	95
2/1/2012	15	3010	95
2/14/2012	15	3100	95
3/5/2012	15	3050	90
3/16/2012	15	2930	90
4/2/2012	15	3040	90
4/12/2012	15	3140	90
7/2/2012	15	3330	80
7/12/2012	15	3350	70
8/2/2012	15	3050	70
8/15/2012	15	3480	50
9/6/2012	15	3190	50
9/24/2012	15	2680	50
10/5/2011	17	2880	112
10/17/2011	17	3420	109
11/1/2011	17	3390	106
11/11/2011	17	3400	98
12/2/2011	17	4380	98
12/13/2011	17	3350	95
1/2/2012	17	3450	90
1/12/2012	17	3400	95
2/1/2012	17	3380	95
2/14/2012	17	3390	95
3/5/2012	17	3390	90
3/16/2012	17	3470	95
4/2/2012	17	3540	90
4/12/2012	17	3600	90
7/2/2012	17	3440	80
7/12/2012	17	3510	60
8/2/2012	17	3170	60
8/15/2012	17	3480	50
9/6/2012	17	3530	50
9/24/2012	17	3140	50